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This bi-monthly bulletin reports in abstract form current literature on science and public policy. Coverage includes both "policy for science" and "science for policy" in the areas of engineering, technology, and pure science but excludes highly technical or narrowly specialized publications. Documents are listed under the headings (1) General, (2) Science, Domestic Problems and National Goals, (3) Needs and Allocation of Resources for Science, (4) National R & D Programs, (5) Science Education and the University, (6) Science Management and Policy-Making Bodies, (7) Science, Foreign Affairs and National Defense, and (8) Science Policy in Foreign Countries. Some 100 documents are individually recorded under one of these categories. Cross indexing is not used. Major meetings and other events in the area are also reported. (GR)

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Science Policy Bulletin

Battelle Memorial Institute

SE 005 848

SCIENCE POLICY BULLETIN

The Bulletin, published bimonthly, reports the current literature in the area of science and public policy. The coverage encompasses both "policy for science" and "science for policy" matters. For brevity, "science" is used to denote engineering, technology, and science.

The Bulletin is intended for individuals engaged in studying, formulating, or implementing public policy relating to science and its use. The purpose of the Bulletin is to aid such individuals by alerting them to new additions to the science policy literature.

The information presented in the Bulletin consists principally of a bibliographic listing of current publications in the area. In addition, major meetings and other events in the subject area are reported.

The bibliography, although covering a broad topical scope, is selective in that publications of a highly technical and narrowly specialized nature are excluded.

The bibliographic information is presented under a number of topical categories. Each cited publication is recorded under a single category; cross indexing is not used. The numbering of publications under each category runs consecutively through all issues of the Bulletin, so that a given number refers to only one citation.

Copies of the listed publications are not available through Battelle but can normally be obtained from the originating agency.

The contribution of information to the Bulletin as well as suggestions and comments on its content, coverage, and format are solicited. All correspondence should be addressed to:

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TABLE OF CONTENTS

AAAS ANNUAL MEETING. 1

BIBLIOGRAPHY

I. GENERAL. 2

II. SCIENCE, DOMESTIC PROBLEMS AND NATIONAL GOALS. 10

III. NEEDS AND ALLOCATION OF RESOURCES FOR SCIENCE. 15

IV. NATIONAL R&D PROGRAMS. 20

V. SCIENCE, EDUCATION, AND THE UNIVERSITY 26

VI. SCIENCE MANAGEMENT AND POLICY-MAKING BODIES. 32

VII. SCIENCE, FOREIGN AFFAIRS, AND NATIONAL DEFENSE 40

VIII. SCIENCE POLICY IN FOREIGN COUNTRIES. 49

AAAS Annual Meeting

Several addresses, symposia, and workshops on matters of science and public policy are planned for the annual meeting of the American Association for the Advancement of Science to be held in Dallas, Texas, 26-31 December 1968.

Invited Lectures and Panels

- "Science and Social Purpose: First Principles for a National Science Policy" -- James A. Shannon
- "Physics, Politics, and the New Puritanism" -- Don K. Price
- Review of United States Science Policy -- arranged by Eugene B. Skolnikoff
- Panel Discussion on Science, Technology, and Latin American Development -- arranged by Harrison Brown
- Panel Discussion on the Financial Crisis in Science -- arranged by H. Bentley Glass

Committee and General Symposia

- Unanticipated Environmental Hazards Resulting from Technological Intrusions -- arranged by Robert E. Light and Walter Modell
- Genetic Technology: Some Public Considerations -- arranged by Daniel M. Singer
- Global Effects of Environmental Pollution -- arranged by S. Fred Singer

Section and Society Symposia

- Biology and Society -- arranged by Paul D. Hurd
- Science and Public Policy Workshop -- arranged by Eugene B. Skolnikoff
- Technology and Values -- arranged by Emmanuel G. Mesthene
- "Evaluating Research Results -- Before and After" -- Allen V. Astin
- Current State of Research Management -- arranged by Gordon K. Teal
- The Current State and Outlook for Research-on-Research -- arranged by D.W. Collier
- Science, Education, and Society -- arranged by Mrs. J. Lewis Scott
- The Flight from Science -- arranged by Arnold A. Strassenburg

BIBLIOGRAPHY

I GENERAL

125. Dedijer, S., "Models of Science for Science Policy", The Advancement of Science, v. 24, no. 122, June 1968, pp. 498-508.

The need to understand the process of R&D and to measure its output "is so great ... that the production of models of science will become a very important concern of the social and behavioral sciences". General specifications for building such models -- but not actual models -- are presented; "this paper is addressed not to the users of models (the science policy community), but to the makers of models (the social and behavioral scientists)". The author, who is director of the Research Policy Program at the University of Lund, starts with a listing of the major questions and problem areas in planning the development and use of science. (It is from these persistent questions and problems that the "growing demand for models of science" for policy purposes has arisen). The author then turns to an appraisal of the present science policy system and contrasts the primitive capability of science policy bodies with the more sophisticated skills of economic policy advisers. The criteria for and limitations on the choice of science models are then considered, and the necessary major elements of analytical models of the science system are presented. Of all the problems involved in developing such models, Dedijer believes that the "most difficult and least explored [one] ... is that of measurement of research output and research performance".

126. Lecht, L.A., Manpower Requirements for National Objectives in the 1970's, National Planning Association, Washington, D.C., PB 177821, February 1968, 471 pp.

In 1966, the Center for Priority Analysis of the National Planning Association published Goals, Priorities, and Dollars: The Next Decade (The Free Press, New York) which estimated the cost of achieving U.S. national goals in the 1970's. The present report continues this inquiry through its investigation of the manpower requirements for achieving goals in such areas as research and development, national security, education, health, and urban development. For each of 16 goal areas, projections are presented for the manpower needs in different occupational groups, in terms of benchmark estimates (which assume a GNP growth rate of 4.5 percent between 1962 and 1975) and in terms of the somewhat higher "aspiration goals". The anticipated percent increase in number employed during the same period is presented for both types of projections. The principal overall finding is that "not enough manpower will be available in ten years" if the U.S. tries to achieve the standards "regarded as desirable and reasonable in the various areas identified as national goals". A scarcity, rather than a redundancy, of manpower is predicted: the reduction in labor requirements from advances in technology are offset "and are likely to be further offset, by the increased quantity of production and especially by the creation of new kinds of products and services".

(For sale by the Clearinghouse for Federal Scientific & Technical Information, Springfield, Va. 22151 -- Price $3.00).

127. Price, D.J. de.S., "The Difference Between Science and Technology", Thomas Alva Edison Foundation, 200 Second Ave., Detroit, Michigan 48226, February 1968, 16 pp.

In a wide-ranging discussion, Price examines the similarities, differences, and parallels between science and technology. The emphasis, perhaps, is more on the differences than on the similarities. Price sees the interaction between the two as more the exception -- albeit often an important and dramatic exception -- than the rule. "We have the position then, that in normal growth, science begets more science, and technology begets more technology. The pyramid-like exponential growths parallel each other, and there exists what the modern physicist would call a weak interaction ... that serves just to keep the two largely independent growths in phase". The article also touches on the interaction between both science and technology and problems of education, on allocation of resources, and on intellectual justification for scientific endeavor.

128. Mesthene, E.G., "How Technology Will Shape the Future", Reprint No. 5, Harvard University, Program on Technology and Society, 61 Kirkland St., Cambridge, Mass. 02148, 1968, 24 pp.

Without trying "to predict the most likely technological developments of the future", Mesthene discusses "some respects in which technology entails change ... and ... the kinds of patterns of change that, by its nature, it brings about in society". Such changes are brought about because technology opens new possibilities and alters the options available to society: the resulting changes may be social, such as the organization of society; or they may be changes of values, as in the case of leisure; or intellectual, as in the current emphasis on the development of new knowledge; or political, as in the changing role and procedures of government. To understand these effects "is an intellectual problem, but to do something about them and profit from the opportunity that technology offers is a political one. We need above all ... to gauge the effects of technology on the polity, so that we can derive some social value from our knowledge".

129. Cairl, J.G. and Gallagher, P.R., Jr., "Government, Science and Technology: A Bibliographical Essay", Public Administration Review, v. 28, no. 4, July/August 1968, pp. 373-381.

The issues and problems of science and government and the management of science and technology are the subjects of this two-part bibliographical essay. The first part cites and very briefly describes some publications (mainly books and government reports) dealing with the science-government issues of: "(1) the advisability of establishing a strong national organization to direct all science ..., (2) the extent to which scientists should participate in national policy making and in politics, (3) the proper relationship between the federal government and the universities, and (4) the balance between scientific freedom and security". The second part of the essay is concerned with the management of scientists and engineers in organizations, organization for R&D, and the evaluation of research output. (An appendix is included that presents bibliographies and other sources of information on the topics covered in the essay).

130. Brode, W.R., "The Handwriting on the Wall", American Scientist, v. 56, no. 2, Summer 1968, pp. 119A-120A,122A-123A.

Science and technology has been expanding at a greater rate than has our population, "but in recent years there have been signs ... that we may be approaching the expansion rate of our population as a potential ceiling". We may be "bumping up against a ceiling in the proportion of our population capable of being scientists and engineers". The evidence for these ceilings is examined, with special reference to the field of chemistry. Trends in graduate and undergraduate enrollments, in relation to population growth, are presented and interpreted as a possible basis for "the slowing down of the scientific growth rate". The negative impact of the draft on the number of science and engineering students is briefly discussed: "Extreme caution in action and careful evaluation of the many factors involved must be considered before commiting the nation to a policy which would cut back or permanently reduce essential and needed professional groups already in short supply".

131. "An Inventory of Congressional Concern with Research and Development", A Bibliography, Prepared for the Subcommittee on Government Research, Committee on Government Operations, Senate, Ninetieth Congress, Second Session, (23 September 1968), U.S. Government Printing Office, Washington, D.C., 1968, 204 pp.

> This 605-item bibliography is the result of a review of all publications from Congressional sources in 1967 which dealt with matters of science policy, broadly defined. The entries consist of House and Senate documents, hearings, public laws, and other legislative documents organized on the basis of the Congressional Committee which originated the document. This volume, the third in what is expected to be a continuing series, also provides a subject index that serves as a cross reference to all items cited. It also records, in chart form, the number of publications issued by the individual House and Senate committees dealing with R&D and the number of publications in each subject area (e.g., resources for R&D, economic development through R&D, environmental quality).

132. Science and Society: A Bibliography 1965-1967, Division of Technical Information, United States Atomic Energy Commission, July 1968, 87 pp.

> This bibliography, compiled by the Atomic Energy Commission Library, is based on their biweekly accession list entitled "Science and Society". It contains over 500 citations "on the general topic of changes wrought by the advances of science on man and his social organizations". Author and subject indexes are included. (For further information, write Mr. Charles M. Gottschalk, AEC Librarian, Division of Technical Information, AEC Library, Germantown, Maryland 20767).

133. Harrison, A., Bibliography on Automation and Technological Change and Studies of the Future, The Rand Corporation, Santa Monica, California, March 1968, 34 pp., (Distributed by the Clearinghouse for Federal Scientific Information, U.S. Department of Commerce).

> "This Bibliography lists works associated with two on-going RAND projects: Automation and Technological Change, and a related informal study of future national and international problems". Entries relate primarily to manpower and automation, and to computer and other technology, plus future-oriented works dealing with economics, education, science, resources, and human welfare. The majority of entries, which total some 350, date from 1960 or later, but occasional ones dating back twenty years are included. An appendix lists private organizations currently engaged, or planning to engage, in future-oriented work. "The Bibliography will continue to be updated periodically".

134. Dedijer, S., "Research Policy Program: A Progress Report from Lund", Reprint from Saertrykk av Nordisk Forum, v. 1, 1968, pp. 55-64.

The Research Policy Program was established in 1966 at Lund University. This report, by its director, describes the activities and accomplishments of the Program. Three major functions of the Program are listed:

- "research in the social science studies of research and of research policy"
- "education and training of young researchers in the field"
- "public service in the form of: 1) training of professional personnel for research policy bodies ... and research management" "2) information and documentation ... on research policy and social science of science studies".

The several specific research and teaching activities of the Program include: a seminar on "Swedish Industrial R&D Policy"; development of a model of science as a social system; a study of international research relations; a comparative study of the R&D policies of India and China; and undergraduate and graduate degree programs in the "science of science". Also described is the Program's International Research Policy Library, which consists of "3000 volumes and over 4000 reprints and pamphlets".

135. Towards the Coherent Study of Science in Human Affairs, First Report of the Director on the Activities of The Institute for the Study of Science in Human Affairs, (April 1966-March 1968), Columbia University, May 1968, 40 pp.

The origins, structure, scope, functions, and programs of Columbia's Institute for the Study of Science in Human Affairs are described by its director, Christopher Wright. The relationship of the Institute to the University and the associated academic program are also reviewed. The "programs of inquiry" now being pursued by the Institute are:

- Medicine and Biomedical Sciences in Human Affairs
- Science Affairs and Public Policy
- Science, Technology, and Social Change
- Institution of Science

In addition, three interdisciplinary projects have been initiated: Computers in Medicine; Federal Organization for Marine Science Affairs; and Ethics and New Technologies.

136. Falk, J. and O'Dea, M., "Science, Technology and Society: An Outline of the Development of Scienomics", The Australian Quarterly, v. 39, no. 4, December 1967, pp. 50-65.

The origins and development of "Scienomics", or "science of science", are traced and discussed. Two lines, or components, of development are identified: basic scienomics (humanities of science) and applied scienomics (science of science). The first "is concerned with theoretical, philosophical and historical questions. It attempts to penetrate to the heart of the socio-technological revolution; to discover its social, political and ethical implications". The second "embraces the multiplicity of fact-finding, data-producing and statistical studies which would form the basis on which day-to-day administrative decisions are made". "When viewed historically, scienomics is seen to be the result of the fusion of [these] two lines of thought". In applied scienomics, the pioneers are Maria and Stanislow Ossowski with their document The Science of Science written in 1936 and J.D. Bernal with his 1939 book, The Science Function of Science. The basic side's pioneer is identified as H.G. Wells. After discussing the pioneers and their contributions, the authors describe the periodicals that serve as forums for Scienomics, and the centers of Scienomic studies.

137. Branscomb, L.M., "Physics and the Nation in a Crystal Ball", Physics Today, v. 21, no. 8, August 1968, pp. 23-28.

A number of problems face physics and physicists in 1968: leveling of the growth rate in support of research, attack on the project-grant system, the role of the national laboratories, dwindling interest in physics in the high schools and colleges, and the difficulties of formulating national policies so as to optimize the benefits of science and technology and account for all the interactions of various national programs. In a whimsical prediction, Branscomb presents (optimistic) solutions to some of these problems in an imaginary report as it might be delivered in the year 1980. Some of the predictions are: physics became "fun" for budding physics teachers, and training in physics became more widespread; physical scientists and social scientists learned to interact very effectively; the universities became truly interdisciplinary and led the way in helping to formulate national goals and plans; the national laboratories were integrated under the National Science Policy Agency, of which Harvey Brooks became the first head; the project-grant system survived, but the self-same Harvey Brooks also devised a magic formula for distributing institutional grants in such a way as to keep everyone happy; and physicists turned out to be such successful politicians that they were elected to Congress in "appreciable numbers".

138. Lear, J., "Public Policy and the Study of Man", Saturday Review, v. 51, no. 36, 7 September 1968, pp. 59-62.

The confluence of three recent proposals -- all aimed at helping the nation find its goals -- are reviewed. The first is Lewis Branscomb's crystal-ball look at what the world of "science and public policy" could (should) be like in 1980 (see previous citation). The second is Nicholas Golovin's proposal for a "fourth branch of government" that would collect data on the state of the nation, define potential problems, develop alternative plans, evaluate ongoing programs, and present the entirety of the information and conclusions to the public for their decision. The third is the new report from the National Academy of Sciences calling for more effective national use of the behavioral sciences (see item 99, Section VI, this issue) and for the creation of a "National Institute for Advanced Research and Public Policy" to undertake 'continuing and long-range analyses of national policies and programs'. The background for these proposals and their prospects are briefly discussed.

139. World Directory of National Science Policy-Making Bodies, Latin America, v. 3, United Nations Educational, Scientific and Cultural Organization (Unesco), Place de Fontenoy, Paris-7^e, 1968, 187 pp.

This volume, the third of a planned four-volume series of directories, presents information on the governmental science policy structure of Latin American countries. As in previous volumes, the information includes the "specific features of the machinery of scientific production in each country, and also the institutional structures responsible for the planning, co-ordination, financing or organization of scientific research at the national level". In each case the aims and scope of the individual institution are briefly described as is its principal methods of operation, its relationship to the government, its administrative and financial structure, officers, publications, and international relations. (Directories of "Europe and North America" and of "Asia and Oceans" were published as the first and second volumes in 1966 and 1968, respectively. The fourth and final volume, "Africa and the Arab States", is scheduled for publication in 1969).

140. Ben-David, J., Fundamental Research and the Universities, Organization for Economic Cooperation and Development, Paris, France, 1968, 111 pp., ($1.50).

The prime thesis of Ben-David's monograph is that there is a basic research gap between Western Europe and the U.S., that its origins go back before World War I, and that it arises from the failure of Europe to adjust its organization of research and higher education to new requirements of science that emerged in the mid-19th century. These unmet requirements include the failure to develop laboratories for organized, specialized research, the canonization of academic disciplines whose "range and contents ... reflected the state of science about the beginning of the 19th century", the failure to provide systematic training in research, and the lack of "effective entrepreneurship in the exploitation of science for practical purposes and in obtaining resources for research". The author then examines

Europe's failure to effectively apply science to technology and reviews the relationships between research and economic growth. What reforms of Europe's science policy are needed? The "main effort should be directed to the creation of universities and/or comprehensive research institutes of a new type in Europe": "multidisciplinary research institutes possessing the authority to confer at least graduate degrees". Ben-David also suggests: separate budgets for higher education and fundamental research; allocation of research funds on the basis of individual and institutional merit; opening the national systems of training and research to international influence; and increased mobility for researchers between institutions.

II SCIENCE, DOMESTIC PROBLEMS, AND NATIONAL GOALS

91. "A National Policy for the Environment", Congressional White Paper, Submitted to the U.S. Congress, Under the Auspices of the Committee on Interior and Insular Affairs, U.S. Senate, and the Committee on Science and Astronautics, U.S. House of Representatives, Ninetieth Congress, Second Session, (October 1968), U.S. Government Printing Office, Washington, D.C., 1968, 19 pp.

    "The Congress is the only institution having the scope to deal with the broad range of man's interactions with his physical-biological surroundings. We therefore believe that our leadership toward a national environmental policy is our responsibility. This white paper serves as the next step toward the needed policy agreement". The paper consists of three parts. The first is a summary of the "Joint House-Senate Colloquium to Discuss a National Policy for the Environment", held on July 17, 1968. The second part presents some alternative steps Congress can take toward the development of a national environmental policy (e.g., a joint resolution calling for a constitutional amendment to better handle the problem; an environmental surveillance unit for Congress; a nongovernment task force to determine policy needs; and a temporary environment management council). The third part is a suggested statement of policy that defines the position and attitude of the federal government and provides guidelines for local government, industry, and individual action. (An appendix lists almost 100 bills and proposals introduced by the 90th Congress for improving the environment's quality).

92. "Joint House-Senate Colloquium to Discuss a National Policy for the Environment", Hearing before the Committee on Interior and Insular Affairs, U.S. Senate, and the Committee on Science and Astronautics, U.S. House of Representatives, Ninetieth Congress, Second Session (17 July 1968), No. 8, U.S. Government Printing Office, Washington, D.C., 1968, 233 pp.

    "In convening this colloquium, it was our expectation that the basic outcome would be an identification of the elements of a national policy for the environment". The main topics discussed were: the dimensions and scope of the problem; approaches that the federal and local governments can take to bring private, short-term interests into conformity with public, long-term interests; the human and social considerations and standards; and mechanisms for aiding and making decisions regarding the environment. In addition to the colloquium, the document contains a reprint of "A National Policy for the Environment", a special report prepared for the Senate Interior and Insular Affairs Committee; a second appendix is comprised of communications received from persons invited to attend the colloquium.

93. "Managing the Environment", Report of the Subcommittee on Science, Research, and Development, to the Committee on Science and Astronautics, U.S. House of Representatives, Ninetieth Congress, Second Session, Serial S, U.S. Government Printing Office, Washington, D.C., 1968, 59 pp.

> "This report conveys the most recent findings of the subcommittee from its continuing investigation of environmental quality and public policy" and presents recommendations for a national environmental policy. The findings are presented under the headings of: sequence of events (with respect to public opinion, political action, and corrective measures) in environmental quality issues; the relationship of man and his environment; the basis for policy; organization for managing the environment; and information and coordination needs. Among the recommendations made are: a national policy for the environment should be developed by government and the private sector; hazards to human health cannot be the sole basis of policy ("Legally useful cause-and-effect data may be so difficult to obtain that dependence on human health as the determinant of abatement action may delay management progress"); the Office of Science and Technology should see to it that R&D funding is directed to acquiring "a greatly expanded knowledge of the environment"; the Department of Interior should coordinate "environmental engineering operations of all Federal programs"; and Congress should develop "an independent capability for assessing the impact of technology on the environment".

94. "Environmental Policy: New Directions in Federal Action", A Symposium (L.K. Caldwell, Symposium Editor), Public Administration Review, v. 28, no. 4, July/August 1968, pp. 301-347.

> The "interaction of policy and administration in the management of selected aspects of the human environment" are described in this set of short papers. In his introductory paper, Caldwell notes that the concept of public responsibility for a quality environment is not yet embodied in public law, but that such a concept is rapidly emerging. He then discusses the problems of environmental administration and inquires into the form and organizational mechanisms needed for administering a national environmental policy. Other papers in the symposium are:
>
> - Environmental Policy and the Congress (Henry M. Jackson)
> - Environmental Management: Water and Related Land (Henry P. Caulfield, Jr.)
> - Federal Policy Planning for the Marine Environment (Edward Wenk, Jr.)
> - Environmental Management and the Department of the Interior (Stanley A. Cain)
> - Providing Environmental Science Services (Walter A. Hahn)
> - Federal Role in the Urban Environment (Robert C. Wood)

95. Mansfield, E. (ed.), The Economics of Technological Change, W.W. Norton & Co., Inc., New York, 1968, 257 pp., ($6.95).

    This book is an overview and interpretation of the dynamics and economics of technological change. It describes and analyzes the ways in which new processes and products are created and assimilated and discusses the public and private policy issues involved. The major topics include:

    - Nature, determinants, and measurement of technological change
    - Nature, size, and management of industrial R&D
    - Innovation and the dicussion of new technology
    - Automation, labor displacement, and adjustment problems
    - Impact, pattern, and trends in government expenditures for R&D
    - Issues of public policy for science and technology (esp. patent policy, military-oriented R&D, basic research, and technical education)

    This book is a companion piece to the author's Industrial Research and Technological Innovation, (W.W. Norton & Co., Inc., New York, 1968, 235 pp., $7.50), which is an econometric analysis of the area.

96. Report of the National Conference on Technology Utilization and Economic Growth, (30 July-4 August 1967), edited by C.W. Mullis, Aerospace Research Applications Center, Indiana University Foundation, Bloomington, Indiana, 302 pp.

    This five-day conference was devoted to a variety of topics regarding the relationships between technology utilization, patterns of economic growth, and programs and mechanisms for coupling the two. The topics discussed during the twelve sessions of the conference were:

    - Technology Utilization and Economic Growth: An Overview
    - The Role of the Business School
    - Economic Growth Studies
    - The Role of the Engineering School
    - Urban Administration
    - Research on Technology Transfer
    - The Role of Federal Government Programs
    - Financial Institutions
    - The Role of Research Institutes
    - The Role of Business Firms
    - The Impact of NASA R&D on Management and Economic Growth
    - Education Needs in Technology Utilization

97. "The Prospects for Technology Transfer", Report of the Subcommittee on Science and Technology, to the Select Committee on Small Business, U.S. Senate, Ninetieth Congress, Second Session, (1 May 1968), U.S. Government Printing Office, Washington, D.C., 1968, 19 pp.

> If technology generated by federally funded R&D "could be transferred from its origin, a significant portion would be useful in commerce and in other Government programs. But no complete and coordinated transfer system is presently operational. The current agency programs do not meet the technology transfer needs. Further, business has been too hesitant in participating in the development of a workable transfer process. Without government-industry cooperation the potential of on-the-shelf technology will never be realized". These conclusions summarize the subcommittee findings from its study, started in 1966, on policies for maximizing the return from federal R&D. The report reviews various facets of technology transfer, including the transfer process itself, the regional approach in transfer, federal agency programs for transferring technology, and financing problems. Drawing from these, the report presents the essential elements for a national transfer program and offers policy recommendations for its implementation.

98. "Conference Probes States' Science Role", Chemical & Engineering News, v. 46, no. 43, 7 October 1968, pp. 58-60.

> Problems and issues concerned with the use and support of science and technology at the state level was the topic of a September conference convened by the National Science Foundation (NSF) and the Southern Interstate Nuclear Board. Among the many problems cited as impeding the effective use of science and technology were the lack of federal and state funds, lack of local university participation (coupled with the "lure of federal grants for academic research"), failure to integrate science units into the "state's political fabric", and the absence of meaningful programs by which R&D can contribute to pressing state problems. Several possible measures for improving the situation were proposed: designation of a federal agency to "manage a program for improving the state-federal relationship in science and technology"; partial support of state science agencies by the federal government; interstate cooperative programs; and better identification of state needs. Some of the current federal efforts in the area, especially those of NSF, are reviewed and suggestions for other mechanisms are cited.

99. Butrico, F.A., "Environmental Pollution in America", Current History, v. 55, no. 326, October 1968, pp. 224-229,245.

Meaningful national goals for environmental quality, backed up by "in-depth action programs and guides for implementation" are urgently needed. The author, who is the former director of the Public Health Service's Office of Resources Development, reviews the nature and magnitude of the problems of pollution control and suggests some approaches for coping with them. He believes that the various "blue ribbon" reports all fall short of indicating practical approaches and solutions to the problems and that disagreements among "experts" have confused the public and triggered numerous congressional hearings and "crash programs of questionable effectiveness". "Information analysis centers and early warning systems ... are needed" to "permit better scientific evaluations and threat identification"; systems analysis is needed "to study man and his total environment, including the health, economic, social, political and technical factors". "Standards of environmental quality must remain flexible so that they can be adjusted as new knowledge is acquired, as financial situations improve, and as the public better understands the problems and issues". New institutional arrangements involving both the private and public sectors are needed for pollution control, and all "segments of society must share in the cost for pollution abatement".

100. Garnsey, M.E. and Hibbs, J.R. (eds.), Social Sciences and the Environment, University of Colorado Press, (Boulder), 1968, 249 pp., ($6.00).

The papers in this volume were presented at the Conference on "The Present and Potential Contribution of the Social Sciences to Research and Policy Formulation in the Quality of the Physical Environment", held in early 1967. The conference findings and recommended courses of action are presented in an "overview" and detailed specifications for "Joint Institutes to Study Society, Environment, and Technology" are provided. Contents include:

- Program Decisions in the Environmental Sciences
- Can Ecology Provide the Basis for Synthesis Among the Social Sciences?
- Geography: The Case for the Specialized Generalist in a Science of Environment
- Public Policy Implications of Environmental Control
- Weather Modification as an Uncertain Innovation
- The Valuation of Public Goods
- Economics and the Quality of the Environment -- Some Empirical Experiences
- Applications of Program Budgeting to Environmental Problems
- Environmental Policy and Management

III NEEDS AND ALLOCATION OF RESOURCES FOR SCIENCE

84. "Hornig Wants R&D Growth to Follow GNP", Scientific Research, v. 3, no. 17, 19 August 1968, pp. 13-14.

Donald Hornig, the President's science advisor, "feels certain that a steady growth of 6 percent a year, plus a 'sophistication factor' of 1 to 4 percent, will be standard within a few years" for the federal R&D budget. This figure, which is considerably lower than that usually proposed, is based on the average growth rate of the gross national product (GNP) over the last few years. But even this rate of growth, Hornig believes, will not be achieved without opposition from competing claimants for federal funds. Frederick Seitz, president of the National Academy of Sciences, concurs with the 6 percent growth rate as "completely reasonable", but believes that "the present 3 percent of the [GNP] spent on R&D is probably the highest practical figure". This is contested by Harvey Brooks who believes that a larger proportion of the GNP will go to R&D in the future: "The pressures of the need for solutions to problems facing society will push it up, irrespective of other factors".

85. Boffey, P.M., "Budget: Status Report on the Federal Cutbacks", Science, v. 161, no. 3836, 13 September 1968, p. 1115.

The federal government will spend about as much on R&D in fiscal year 1969 as it did in 1968, and support for academic research will remain at the same level as last year. This forecast takes into account the anticipated budget cuts still to be made by Congress and the Executive. To handle these cutbacks, the Bureau of the Budget "has assigned spending targets to each federal agency"; after these cuts are made 'we'll come out pretty close to the fiscal 1968 level' of 16.5 billion, according to Charles Zwick, director of the budget bureau. However, Zwick does see further cuts in the budgets of the National Science Foundation, National Aeronautics and Space Administration, the Atomic Energy Commission, the Department of Health, Education and Welfare, and the Department of Defense. The overall budget reductions are expected to "have a sharp effect on the level of spending in fiscal year 1969", but "much less impact on the level of obligations, or commitments to spend".

86. Graduate Student Support and Manpower Resources in Graduate Science Education, Fall 1965, Fall 1966, Office of Planning and Policy Studies, National Science Foundation, Washington, D.C. 20550, June 1968, 112 pp.

This report, the first of its kind, presents and analyzes data on student enrollments, sources of student support, and faculty and postdoctorals in graduate science departments. Major sections of the report include:

- Graduate Enrollments in the Sciences: full-time and part-time students; U.S. and foreign students; first-year vs. advanced students
- Types of Major Support of Full-Time Graduate Students: fellowships; traineeships; research assistantships; teaching assistantships
- Sources of Major Support of Full-Time Graduate Student in the Sciences: federal government; institution and state-local government; industry; private foundations; other institutions; foreign sources; loans and other sources
- Faculty and Postdoctorals: graduate faculty; research professors, postdoctorals
- Comparisons with Other Graduate Education Statistics: graduate directories, degrees awarded, fellowship and traineeship awards.

(For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 -- Price 65 Cents).

87. "Foundations Get More Grant Requests in Backwash of Federal Cutbacks", Scientific Research, v. 3, no. 17, 19 August 1968, pp. 19,21.

"One reaction to the cutback of federal funds for scientific research has been an increase in requests for grants received at those private foundations that support science". The Research Corporation, for example, has received 53 percent more grant applications this year than last; the American Chemical Society reports a 15 percent increase, and the American Cancer Society reports a similar increase. Some foundations are adjusting programs to meet the demand. The Research Corporation "is dropping its institutional-support grants ... to increase its project-support grants, while maintaining its overall budget". The American Chemical Society, "with the Petroleum Research Fund, whose grants it administers, ... will distribute 200 grants of $5,000 each for existing projects in petroleum chemistry".

88. Resources for Medical Research, Dollars for Medical Research 1965-67, Report No. 12, U.S. Department of Health, Education, and Welfare, National Institutes of Health, Bethesda, Maryland 20014, June 1968, 167 pp.

Funds for biomedical research, from all sources, totaled $2.3 billion in 1967. This is an 11 percent increase over 1966 and is the same percentage increase that has been maintained since 1963. Biomedical research now accounts for 9.6 percent of all R&D, as compared with 8.6 percent in 1964. Almost two-thirds of the $2.3 billion national total comes from federal agencies, and about one-fourth from industrial companies. "This Report carries forward the analysis, presented in earlier issues of this series of the Nation's investment for biomedical research, with particular focus upon developments for the 1965-1967 period". The publication also "presents detailed data for 1966 on (1) the flow of Federal funds for all R&D and for biomedical research to specific institutions of higher education, and (2) a geographic distribution of Federal research funds".

(For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 -- Price $1.25).

89. "NSF Sees Dreary Outlook for Funding of Ecology Centers", Scientific Research, v. 3, no. 16, 5 August 1968, p. 19.

The National Science Foundation (NSF) says there's no chance of financial support over the next two or three years for either of two proposed ecological-research centers. "Associated Universities, Inc. had hoped to get a commitment from NSF this year for a tropical marine science center to be built in Puerto Rico at a cost in excess of $10 million", but "is now considering a scaled-down proposal with an initial cost of $1 million". The Ecological Society of America, after missing its June target data for submitting a proposal to NSF, is now moving toward "incorporation of a consortium to sponsor its proposed "research complex that would cover the total environment, with the principal site located somewhere in the Caribbean". It intends to submit a proposal to NSF later this year. NSF officials point out some policy differences on tropical research facilities, in addition to the "dreary financial outlook", that lessen the chances of immediate support of the programs.

90. Rapid Excavation: Significance, Needs, Opportunities, Committee on Rapid Excavation, National Research Council, National Academy of Sciences, National Academy of Engineering, Publication 1690, Washington, D.C., 1968, 48 pp.

A ten-year $200-million research effort is recommended for improving underground earthmoving technology. The aim of the program is to decrease the time required for excavation by up to three times, while reducing the real cost by 30 percent. In calling for the program, the report discusses the important role of excavation in mass transportation, in alleviating overcrowed cities, and in improving the quality of the environment. "The current rate of improvement in underground technology is constrained by inadequate technical knowledge and insufficient industrial incentive to change current practice radically". If the government "initiates this added research effort and concurrently evolves a realistic technology-transfer plan, the competitive nature of the excavation industry is such that the engineering development needed to convert research results into operable equipment and processes will be privately undertaken". The report discusses the significance of earthmoving technology, outlines the needs and specifies a research program, and assesses the value of the proposed investment of research funds.

(For sale by the Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Ave. N.W., Washington, D.C. 20418 -- Price $2.50).

91. "Planetary Astronomy Gaining Impetus; New Instruments Requested", News Report, National Academy of Sciences, National Research Council, National Academy of Engineering, October 1968, pp. 1-3.

The current status and future needs of planetary astronomy are examined in a new report, Planetary Astronomy: An Appraisal of Ground-Based Opportunities, issued by the National Academy of Sciences' Space Science Board. The report emphasizes the new opportunities opened up by advances in observational equipment, techniques, and sites. "To capitalize on the full potential of ground-based planetary astronomy, the report recommends the construction in the Southern Hemisphere of a 60-inch optical telescope specifically reserved for study of the planets". It also calls for construction in the U.S. of a large new dish-type facility for planetary radar astronomy, two large radio-telescope arrays, and new instruments for infrared astronomy. Other recommendations include "support of other technological development, such as image enhancement and image scanning, and an effective worldwide photographic planetary patrol".

(For sale by the Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Ave. N.W., Washington, D.C. 20418 -- Price $3.50).

92. Nelson, B., "Federal Cuts: Biologists Caucus", Science, v. 161, no. 3843, 23 August 1968, p. 767.

Several hundred biologists recently gathered at the Woods Hole Marine Biology Laboratory to discuss what action should be taken in light of federal cutbacks in research support. Representatives of the National Science Foundation and the National Institutes of Health stated that their research grants program would have to be reduced by 15-20 percent, and that funding prospects looked even worse for next year. Philip Handler, Chairman of the National Science Board, told the group that he saw "no increase [in funding] for the next 2 years". He indicated that "scientists should work harder to communicate their needs for research funds and urged them to tell government officials just where cutbacks hurt, to describe the number of graduate students not being trained, and research not done". Towards the conclusions of the meeting, "the scientists began to focus more on the need to establish some priorities for research over other federal expenditures", such as the ABM system and Vietnam. "It is ... clear that, if scientists are really going to influence the government or to change its priorities, they are going to have to become much more involved in politics than most have been willing to be in the past."

93. "DOD Research Chiefs Pleased With Budget--Except for Themis", Scientific Research, v. 3, no. 18, 2 September 1968, p. 23.

"Defense Dept. research officials have breathed a figurative sigh of relief over the relatively modest cut made by Congress in its first pass at their fiscal-'69 budget. The House Appropriations Committee reduced the DOD's $8-billion request for research, development, testing and evaluation by only 6-7 percent -- to $7.5 billion. But the same officials are fearful that the Senate may make additional cuts of its own. As of now, most of the $500-million cut will come out of the development category. Surprisingly, the research category -- where $433 million had been requested -- was cut by only $9 million, all of it from Project Themis. Moreover, in making the Themis cut the Appropriations Committee directed DOD not to make any new Themis grants. Pentagon officials are hoping the Senate will remove this restriction; if it does, and if the full '69 request of $36 million is appropriated, DOD plans to award 50 new Themis grants to go with the 92 now in force. This is unlikely, however."

94. "NSF Spending May Be Down as Much as 10 Percent", Scientific Research, v. 3, no. 19, 16 September 1968, p. 23.

"At the National Science Foundation, where the '69 appropriations for new obligations have been cut nearly 20 percent, officials expect to have to cut actual spending this year by only 6-6.5 percent. But a disproportionate share of the cut is coming out of the hide of research project grants. Other cuts in NSF spending have already been identified by the agency. There will be no funds for research participation by high-school teachers nor for special projects in precollege teacher education this year. At the university level, there will be no funds for senior postdoctoral fellowships nor any new funds for science development programs. Also, Foundation officials say, there will be virtually no new commitments for construction, nor for a proposed oceanographic vessel."

IV NATIONAL R&D PROGRAMS

79. Spangler, M., A Preliminary Review of Alternative Federal Measures of Encouraging Private Investment Enterprise in Marine Resource Development, National Planning Association, Washington, D.C., PB 178203, May 1968, 140 pp.

> This report examines over 50 measures that the federal government might take to stimulate private investment in marine resource development, and concludes that "there is no dearth of measures" for achieving the objective. The report, prepared under contract with the National Council on Marine Resources and Engineering Department and the National Science Foundation, analyzed various measures within the broad categories of: federal R&D financing; federal financial support (cost-sharing, subsidy, etc.); legal, regulatory, and administrative measures (leasing rights, quasi-public-private corporations, etc.); social overhead measures (education programs, recreation facilities and services, weather and other informational services, etc.); and international measures (bi-national and multi-national ventures, port and harbor developments). Among the measures and priorities recommended were: high priority to federal support of R&D to achieve a low-cost mining technology; among R&D measures, first priority for mining, second for exploration, and a low priority for processing; financial and administrative measures for those cases where technology already exists; and a farily high priority to transfer of technologies from military and space programs.
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> (For sale by the Clearinghouse for Federal Scientific & Technical Information, Springfield, Va. 22151 -- Price $3.00).

80. "Marine Science Spending Suffers From Budget Slashes", Ocean Industry, v. 3, no. 10, October 1968, p. 8.

> "Prospects for Federal spending on marine science programs in fiscal year 1969 now indicate that such spending will be slightly above the level of 1968 -- but well below the ambitious total sought originally by the Administration". When the budget trimming is over, funding for 1969 is expected to be about $460 million, as compared with $448 million in 1968 and the $516 million requested for 1969. The biggest impact will be on new programs and constructions: most "new starts will be postponed, hopefully to be renewed in FY 1970". The separate impacts anticipated for research, development, and operations are briefly discussed, and the probable consequences for the Navy's budget are surveyed. With respect to research operations, the Navy's budget "will be reduced by around $25- to $35-million"; exploration and development will be trimmed slightly, perhaps $1- to $2-million; long-range development of technology, such as the Sealab program, will

lose $8- to $10-million from the requested funds; and both operations and capital investments will be reduced by up to $10-million each.

81. "Sea-Grant Extension Program", Science, v. 161, no. 3843, 23 August 1968, p. 772.

"A compromise bill, which authorizes a 2-year extension of the Sea-Grant College program and increases financial support substantially, was signed by President Johnson on 14 August. The measure, introduced by Senator Claiborne Pell (D-Rhode Island) and Representative Paul G. Rogers (D-Florida), represents an effort to increase trained manpower for oceanography programs. The amount authorized is $6 million for the current fiscal year and $15 million for the succeeding one, compared with $5 million authorized for last year".

82. "Marine Sciences Council Initiates Great Lakes Study", Press Release, National Council on Marine Resources and Engineering Development, Washington, D.C., 27 August 1968, p. 1.

"The National Council on Marine Resources and Engineering Development ... has contracted with the National Planning Association to conduct a study of the use and management of the coastal and water resources of Lakes Erie and Superior". The study will "review research findings, inventory and evaluate land and water uses ... and analyze the effectiveness of measures employed in the past for determining utilization of coastal zone resources ..." The opportunities for increasing the use of coastal zone resources through marine science and technology will also be analyzed. The study, which will cost $41,190, will be completed by May 1, 1969.

83. Wenk, E., Jr., "Spacecraft for an International Decade of Ocean Exploration", Paper presented at the International Academy of Astronautics and the International Astronautical Federation, New York, N. Y., (15 October 1968), 24 pp. (To obtain this paper, write Executive Office of the President, National Council on Marine Resources and Engineering Development, Washington, D.C. 20500).

Wenk, Executive Secretary of the National Council on Marine Resources and Engineering Development, reviews the goals and activities of the Council, discusses the potential of spacecraft oceanography, and comments briefly on the proposed "International Decade of Ocean Exploration" (IDOE). The emerging national policy on oceanography is described, and prospects for the future are forecast: federal R&D expenditures are predicted to grow "15 percent per year for the next ten years". Several areas of application for spacecraft oceanography are cited: measurement of ocean temperatures and current, sea states, biological activity, coastal processes, and salinity and water density.

As for IDOE, Wenk foresees an international program of 8-10 billion dollars, with a U.S. contribution of some $3 billion; the scientific and engineering goals and priorities for IDOE are now under study by the National Academies of Sciences and Engineering.

84. "NAS and NAE Providing Advice on U.S. Role in International Decade of Ocean Exploration", News Report, v. 18, no. 17, National Academy of Sciences, National Research Council, National Academy of Engineering, August/September 1968, p. 6.

The National Academy of Sciences (NAS) and the National Academy of Engineering (NAE) will jointly provide scientific and engineering advice for the International Decade of Ocean Exploration. The Decade "is envisioned as a period of intensified collaborative planning, development of national capabilities, and execution of national and international programs of oceanic research and resource exploration". A study to identify the scope and content of the Decade will be undertaken by the NAS Committee on Oceanography (NASCO) and the NAE Committee on Ocean Engineering (NAECOE). A Steering Committee has been established by NASCO and NAECOE; a working session to be directed by the Steering Committee is scheduled for early September at the NAS-NAE Summer Studies Center at Woods Hole, Massachusetts. A Joint NASCO-NAECOE report on the study is expected to be completed in April 1969. Members of the individual committees are listed.

85. Lewis, R.S., "The End of Apollo", Bulletin of the Atomic Scientists, v. 24, no. 7, September 1968, pp. 2-6.

When "the most ambitious and costly engineering effort in our history" comes to an end -- "then what"? This article discusses the problems which will result from the lack of future space goals, and the specific benefits so far obtained from Project Apollo. Significant questions and problems that arise in the absence of a large space program include: where will "the largest force of skilled technicians and engineers that has ever existed in this country" go? Can industry absorb all of them? Will the national capability in space technology come to a halt without a space program? Beyond the attempt to be first on the moon, Project Apollo promises "to provide this nation with a space transportation system, a life support system, a worldwide space communications array, an automatic checkout and monitoring system for complex rockets and spacecraft, a sophisticated data gathering and transmission system, the technique of landing on and leaving another planet ... and, finally an industrial establishment capable of designing and manufacturing space flight systems".

86. Man's Survival in a Changing World: United States Participation in the International Biological Program, U.S. National Committee for the International Biological Program, 2101 Constitution Ave., Washington, D. C. 20418, 29 pp.

The approaches and programs constituting the U.S.'s participation in the International Biological Program (IBP) are described and discussed. The U.S. programs are organized around a "new type of approach -- which has been called the beginning of 'big biology' -- involv[ing] the use of multidisciplinary teams of researchers working on all components of a specific environment and the interactions that occur between them". The "large-scale integrated programs" of the U.S. focuses on two main centers of interest: Problems of Human Adaptability and Problems of the Environment. The programs under the first include "Adaptation of Eskimo Populations", "Population Genetics of the American Indian", "Biology of Human Populations at High Altitudes", "Nutritional Adaptation to the Environment", and "Ecology of Migrant Peoples". Programs in the second category include "Convergent and Divergent Evolution", "Biogeography of the Sea", "Physiology of Colonizing Species", "Aerobiology", "Phenology", "Analysis of Ecosystems", and "Conservation of Environments". Several other programs, proposed but not yet approved, are described.

87. "NSF to Look for 'Focus' in IBP--A New Trend?", Scientific Research, v. 3, no. 20, 30 September 1968, p. 19.

"The National Science Foundation has undertaken a review that may mark the beginning of a trend. At the request of the Bureau of the Budget, the Foundation has gone over the research ideas proposed as the U.S. contribution to the International Biological Program -- to see if what was essentially a bag of miscellany could be sorted into research activity with a specific focus. The idea was not to insist that IBP research have some specific application -- but, rather, to pull together from scores of unrelated projects those that might be coordinated around an objective. Even before the Foundation completed its review, which will be used this fall in deciding how much money to allocate to IBP in the fiscal-1970 budget, some government officials were hinting that NSF may be asked to undertake similar analyses in other areas of basic research -- as the budget situation continues to tighten and pressure builds up on the Foundation to show that the research it sponsors is important".

88. Hallgren, R. E., "The World Weather Program", TRW Space Log, v. 8, nos. 1/2, Spring-Summer 1968, pp. 2-17.

A description of the World Weather Program (WWP), its goals, scope, and current status, is presented by the Director of World Weather System, Environmental Science Services Administration. WWP is the U.S. program for an "intensified cooperative effort in international meteorology". The Program has three goals: "to develop a capability to make dependable long-range weather predictions (two weeks is our target); to explore theoretically the degree to which the large-scale features of weather can be modified; and to further international cooperation without which the goals are unattainable". The Program has evolved into two major parts -- the World Weather Watch and the Global Atmosphere Research Program (GARP). The World Weather Watch "includes the design, development, and implementation of an international system for the regular observation of the atmosphere over the entire globe and for the rapid and efficient communication, processing, and analysis of worldwide weather data". GARP will conduct a comprehensive program of research on the physics of the atmosphere, including major data-gathering efforts. Several conferences and symposiums have been held to plan and coordinate the Program. A full decade is expected to be required to bring the Program into existence.

89. "ESSA Science and Engineering", U.S. Department of Commerce/Environmental Science Services Administration, Washington, D. C., April 1968, 150 pp.

"This publication is the first consolidated overview of the Environmental Science Services Administration (ESSA), since its establishment in July of 1965." The report discusses science and engineering in ESSA during FY '66 and FY' 67 in terms of its missions and objectives. A Program Analysis Matrix summarizes all ESSA science and engineering operations. The report is divided into seven chapters:

- Mission, Objectives, Organization, and Resources
- ESSA's Products and Services
- Selected Highlights
- Describing and Understanding Man's Environment
- Environmental Prediction and Warning
- Engineering Activities and Services
- Supporting Facilities, Services, and Development Activities.

A listing of ESSA publications and papers during the 1965-1967 period is included.

90. Major Activities in the Atomic Energy Programs, January-December 1967, United States Atomic Energy Commission, Washington, D. C., January 1968, 397 pp.

Activities and accomplishments of the Atomic Energy Commission (AEC) for the year 1967 are presented in 17 chapters. Chapters most relevant to science and public policy are:

Ch. 2: Safeguards and Materials Management
Ch. 3: The Nuclear Defense Effort
Ch. 5: Reactor Development and Technology
Ch. 6: Licensing and Regulating the Atom
Ch. 7: Operational Safety
Ch. 11: The Plowshare Program
Ch. 12: International Cooperation Activities
Ch. 13: Informational Activities
Ch. 14: Nuclear Education and Training
Ch. 15: Basic Research
Ch. 16: Industrial Participation Aspects

Appendices present international agreements and AEC's financial summary for fiscal year 1967.

(For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 -- Price $1.50).

91. Jamison, A., "IHD: International Symbol or 'National Embarrassment'?", Science, v. 161, no. 3846, 13 September 1968, pp. 1118-1119.

U.S. participation in the International Hydrological Decade (IHD) has almost come to a standstill for lack of funds. The program, which was initiated in 1965, has as its objectives the encouragement of research in hydrology throughout the world, the collection of water resource data, and the development of cooperative programs. Since its inception, the U.S. program "has had trouble fitting into the budget of any one agency and has been relegated to a low-priority position in several". And in the current year, with all international programs in financial trouble, IHD may be hit hardest of all by budget cutbacks. This article describes the inception of IHD, some of the proposed U.S. programs, and its current financial problems and bleak prospects for the future. "In the absence of any really substantive American participation in IHD, the leadership mantle has passed to the U.S.S.R."

V SCIENCE, EDUCATION, AND THE UNIVERSITY

66. Strickland, S. (ed.), Sponsored Research in American Universities and Colleges, American Council on Education, 1785 Massachusetts Ave. N.W., Washington, D.C. 20036, 1968, 247 pp., ($5.00).

This volume, which was prepared for the Committee on Sponsored Projects of the American Council on Education, presents a series of commentaries on academic research sponsored by the government and its administration. The volume is divided into four parts: the first looks at sponsored research from the perspective of the academic institution and the second from the perspective of the sponsor; the third part is devoted, largely, to the ways universities have organized themselves for sponsored research; and the fourth examines some continuing issues and concerns such as classified research, conflict-of-interest, and cost sharing. Some of the questions considered are the relationship between research and teaching, the place of federal funding in the institutional research program, and the influence of the sponsoring agencies on university policy. "One premise of this book is that sponsored research, despite some real problems and some bogies that arise out of it, has been a beneficient force in the educational, scientific, and technological development of the United States over the last quarter of the century".

67. Orlans, H. (ed.), Science Policy and the University, The Brookings Institution, 1775 Massachusetts Ave. N.W., Washington, D.C. 20036, 1968, 352 pp., (Cloth, $7.50; paperback, $2.95).

This volume is a compilation of papers presented at a seminar on "Science, Technology, and Public Policy" by the Brookings Institute during the period 1964-1966. The topics include various issues of government policy toward university science, especially the questions of resource allocation among the different sciences, and means for improving government-university relationships. The papers, each of which is followed by discussion, include:

- Federal Money and University Research (Don K. Price)
- The Future Growth of Academic Research: Criteria and Needs (Harvey Brooks)
- The Government and University Science: Purchase or Investment? (Christian K. Arnold)
- The Science Development Program (Howard E. Page)
- Allocation of Federal Support Among Scientific Fields (Hendrik W. Bode)
- Government Allocations to Basic Research (Alvin Weinberg)

- Resource Allocation in High Energy Physics (David Z. Robinson)
- Big Science and Graduate Education (Wolfgang K. Panofsky)
- Making the 1967 Science Budget (Elmer B. Staats)
- Presenting Scientific and Technical Programs to the Congress (Herbert Roback)
- Equipping Congress to Deal with Science (William D. Carey)
- Old Saws and New Materials: A Consideration of Some Ethical Problems (John F. Morse)
- The Support of Academic Scientific Research in the United Kingdom (Harry Melville)
- A View from the Campus (Homer D. Babbidge, Jr.)

(This book was reviewed in Science, v. 161, no. 3847, 20 September 1968, pp. 1232-1233, and in Scientific Research, v. 3, no. 19, 16 September 1968, pp. 46-47).

68. The Dynamics of Academic Science, A Degree Profile of Academic Science and Technology and the Contributions of Federal Funds for Academic Science to Universities and Colleges, National Science Foundation, Washington, D.C. 20550, NSF 67-6, January 1967, 190 pp.

This report, prepared by W.V. Consolazio, is a statistical analysis of the relationships between academic science and R&D support from the federal government. The author reviews the recent history of government-university relationships and examines the academic institutions and their resources, the pattern of federal funds for academic science, and the impact of these funds on the institutions. He also presents profiles of institutions which profit from federal funds or participate in federal science programs and of those that do not. The study finds that "the principal recipients of federal funds are also the principal producers of advanced degree manpower in science and technology"; some 350 institutions -- including most Negro colleges and universities and several distinguished liberal arts colleges -- fail to benefit from federal science programs; over 700 institutions receive "21 percent of their total income from federal funds for academic science"; about one-half of these funds come from one agency, the U.S. Public Health Service; and many private universities, especially those engaged in medical education and research, receive upwards of 40 percent of their income from federal funds. In the latter cases, the author warns that such institutions "may be gravitating toward an irreversible, economic dependence on the Federal Government".

69. A Study of NASA University Programs, Prepared by the Task Force to Assess NASA University Programs, Office of Technology Utilization, National Aeronautics and Space Administration, Washington, D.C., NASA SP-185, 1968, 79 pp., ($3.00).

The impact of NASA's university programs on the universities, NASA, and the nation is assessed in this report. The assessment, performed by NASA, consists of a comparison between the results of the total programs (grants, contracts, disciplines, programs, and projects) and the "goals publicly expressed by NASA managers". Information was obtained by interviews, university visits, and in-depth case studies at selected universities having NASA programs. Findings of the study and suggested changes in the program are discussed. Some of the results include: the programs have been successful in "obtaining the expertise of the university-community to help meet the aeronautics and space goals of NASA and the Nation"; they have had a beneficial impact on the university; however, "universities have not taken advantage of the opportunities offered by NASA to innovate in research management, multidisciplinary research, and government-industry university relations"; industry "has benefited from NASA university programs", however, "industry-university relations ... have not been altered"; NASA's "Sustaining University Program" has not been successful; the grants are often viewed as "giveaways to help universities" and the quality of research is poor; the temporary in-residence faculty programs are regarded as highly successful. Some of the suggested changes include: organize "research-oriented management science groups within NASA" to improve utilization of sponsored research; give NASA renewal authority on grants to allow more leverage once the grant is awarded; and establish closer working relations with participants in NASA-university programs.

70. Seitz, F., "Science, the Universities, and Society", American Scientist, v. 56, no. 3, Autumn 1968, pp. 288-297.

The use of universities as battlegrounds for social revolution may reduce them to "degree factories" providing "rudimentary teaching and the minimum essential research associated with such teaching". After outlining the origins of the university and the evolution of the American university, the author (President, American Academy of Sciences) briefly describes the beginnings of science and its growth in the U.S. with the support of the federal government. He notes that "a significant part of the leadership of our nation, both in Congress and in industry, still have major doubts about the wisdom or need of expenditures for basic research. As a result, we are now witnessing a leveling off in the funds available for research". This is partly attributed to the "feeling" that the academic community -- the major recipient of basic research funds -- has "turned its back on the pressing problems of the nation", and that it is "a much less useful implement in the development of our society" than was earlier believed. This, coupled with its embroilment in the present "social struggle", makes for an uncertain future for the American university.

71. Carroll, J.D., The Implications of President Johnson's Memoranda of September 13 and 14, 1965, for the Funding of Academic Research by Federal Agencies, Syracuse University, Syracuse, N. Y., 1967, 233 pp., ($3.00).

"This study has two immediate purposes. The first is to discover, review, and examine selected aspects of the policies and procedures pursued by federal agencies in funding academic research, with particular emphasis on the period 1960 to 1965. The second is to analyze the implications of demands for change in these policies and procedures as these demands are expressed in President Johnson's Memoranda of September 13 and 14, 1965". The report describes the federal academic research funding system, discusses its impact on the financial structure of higher education, examines the legal and administrative decision-making patterns used by federal agencies, and reviews the demands for reforms made by the academic community. "The President's Memoranda partially meet these demands in that they direct agencies to effect a wider distribution of funds, and to support institutions as institutions, while giving institutions some decision-making authority over the exact research undertaken". But, there is a need for new policy that distinguishes "between funding of research on the basis of scientific merit, and funding of research on the basis of educational, economic, and social need".

72. "A National Program of Institutional Grants for Science and Science Education", Study for the Subcommittee on Science, Research, and Development, Committee on Science and Astronautics, U.S. House of Representatives, Prepared by the Science Policy Research Division, Legislative Reference Service, Library of Congress, Serial R, U.S. Government Printing Office, Washington, D.C., 1968, 136 pp.

"The purpose of this study is to provide background information on the legislative precedents of the national institutional grants program proposed to be established by H.R. 875 ... and similar bills". "The report touches briefly on the evolution of the institutional support concept for science as a means to complement the project grant system". A review is presented of the programs of the various federal agencies which provide direct aid for institutional support to colleges and universities for science and science education, including statistical data showing the distribution of funds to individual institutions. An annotated chronology which traces the history of the institutional support concept from 1945 to the present is given. A "section-by-section analysis" of H.R. 875 is made, with the conclusion that the "coverage of the proposed legislation appears to need clarification, both regarding fields covered and regarding areas to be included in the science teacher training category".

73. "Proposals Invited for New Grants Program for Basic Research Relating to Education", News Report, v. 18, no. 7, National Academy of Sciences, National Research Council, National Academy of Engineering, August/September 1968, p. 14.

The National Research Council of the National Academy of Sciences has announced a new program of grants in support of basic research in education. The program's aim is "to encourage research that will increase fundamental knowledge and deepen insight into critical problems in education, theory, policy, and practice". Two criteria will receive emphasis when reviewing proposals: "1) the degree to which the research would contribute to fundamental knowledge and 2) its relevance to education". Some of the areas in which the committee feels research is needed include: 1) Studies of social and cultural influences on patterns and strategies of learning; 2) The study of genetic individuality and its relation to functional diversity among different roles in society; 3) Historical studies of student organization and student collective behavior; 4) Research on the learning of strategies and skills which an individual uses to code information into memory; 5) Theoretical studies of optimal sequencing of activities in learning a given skill or body of information. (Requests for further information should be addressed to: Committee on Basic Research in Education, Division of Behavioral Sciences, NAS-NRC, 2101 Constitution Ave., Washington, D.C. 20418).

74. "Campus Sanctions", Science, v. 161, no. 3848, 27 September 1968, p. 1328.

Students "who participate in serious campus disturbances could lose federal aid", under a compromise adopted by House-Senate conferees on the $7.2 million Higher Education Authorization Bill. "A major question for conferees was whether or not to make it mandatory for universities to act to discipline students receiving federal aid. The compromise specifies that a university must take action to withdraw federal aid for a period of 2 years from a student who is convicted by a court of crimes resulting from campus demonstrations". "In the case of a student involved in a demonstration on his own campus and who is not convicted of criminal action, the university apparently may exercise discretion in withdrawing federal aid". "It appears, however, that universities may withdraw federal aid when it is established that the student has willfully and substantially disobeyed university regulations or the orders of college officials. Before denying federal aid to a student the institution must grant him an opportunity for a hearing, at which it must be found that the individual's offenses are of a serious nature contributing substantially to the disruption of the administration of the university".

75. Vetter, B.M., "The Draft -- And Its Consequences", Scientific Research, v. 3, no. 18, 2 September 1968, pp. 38-40,42.

The short-range and long-term consequences of the military draft on scientific and engineering manpower is surveyed. Fall 1968 enrollments appear to be "normal or very close to normal primarily because of the low draft calls this summer and early fall". However, the "first substantial drop in enrollment is not expected to come before next spring but a settlement in Vietnam could well bring sharply lower draft calls". "If next year's draft calls approach this year's levels, the country's growing pool of scientific and engineering manpower will suffer a severe and long-term setback". "In the engineering and scientific fields, the number of master's degrees in 1968-69 has been projected at 31,660". Under the present draft regulations about "30 percent of them will be lost; and in 1970-71 about 50 percent will be lost". Total loss of science-engineering master's degrees over the three year period "may go as high as 56,000". "At the doctorate level, the first loss will show up in the class of 1971-72. Using the same loss ratios ... the total loss in Ph.D.'s ... in 1972 through 1974 will be about 18,000".

76. "A Brookhaven for Computer R&D", Scientific Research, v. 3, no. 20, 30 September 1968, p. 15.

A study, known as ISE (Information Systems in Education), is being conducted by Associated Universities Inc., a Washington-based consortium, to "find ways of helping higher education make better use of computers". The National Science Foundation and the Office of Education have provided funds for the study. "Recommendations on whether or not a computer lab should be established, and if so, what shape it should take will be incorporated in a report to be delivered to the sponsors next April". "A full-time staff is currently gathering information for the study guided by an advisory committee of senior executives drawn from universities, industrial research labs, and educational organizations. T. Keith Glennan, president of Associated Universities, ... is chairman of the advisory committee, and John A. Hrones, on leave from his position as provost of Case-Western Reserve University, directs the staff".

VI SCIENCE MANAGEMENT AND POLICY-MAKING BODIES

99. The Behavioral Sciences and the Federal Government, National Academy of Sciences, Washington, D.C., Publication 1680, 1968, 107 pp., ($3.50).

This report, prepared by the Advisory Committee on Government Programs in the Behavioral Sciences (of the National Research Council), examines "how the knowledge and methods of the behavioral sciences can be brought to bear effectively on the programs and policy processes of the federal government". Among the major recommendations of the committee are: the creation of a "National Institute for Advanced Research and Public Policy" to undertake "continuing and long-range analyses of national policies and problems ... and to provide a forum ... for the full exploration of the growth and application of knowledge from all the sciences to the major issues of the society"; broader use of behavioral and social scientists in decision-making positions in all federal agencies; more support for research in both domestic and foreign social problems; greater behavioral science capacity and representation in the Office of Science and Technology and the President's Science Advisory Committee; and increased institutional and departmental grants from the National Science Foundation. Two additional reports, complementing the present one, are being prepared for presentation to Congress next year: one will attempt to formulate a national policy for the social sciences, and the other will survey the current state and future needs of the behavioral sciences.

(For sale by the Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Ave., Washington, D.C. 20418).

100. Shils, E. (ed.), Criteria for Scientific Development: Public Policy and National Goals, The M.I.T. Press, 1968, 207 pp., ($8.95).

This volume is a selection of articles originally appearing in Minerva between 1962-1967. The essays, collectively, focus on "science planning" -- on the criteria and mechanisms for allocating resources among different scientific disciplines, and between pure and applied research. The place and problems of science in developing nations is a subtopic discussed in respect to "scientific choice" and national goals. Contents include:

- The Republic of Science: Its Political and Economic Theory (Michael Polanyi)
- Criteria for Scientific Choice (Alvin Weinberg)
- The Distribution of Scientific Effort (C.F. Carter)

- Choice and the Scientific Community (John Maddox)
- The Complexity of Scientific Choice: A Stocktaking (Stephen Toulmin)
- Criteria for Scientific Choice II: The Two Cultures (Alvin Weinberg)
- Research and Economic Growth -- What Should We Expect? (B.B. Williams)
- Scientific Choice and Biomedical Science (Alvin Weinberg)
- The Complexity of Scientific Choice II: Culture Overheads or Tertiary Industry? (Stephen Toulmin)
- The Warrants for Basic Research (Simon Rottenberg)
- Underdeveloped Science in Underdeveloped Countries (Stevan Dedijer)
- Technical Assistance and Fundamental Research in Underdeveloped Countries (Michael J. Moravcsik)
- Some Practical Suggestions for the Improvement of Science in Developing Countries (Michael J. Moravcsik)
- The Growth of Science in Society (Michael Polyani)
- The Isolation of the Scientist in Developing Countries (Abdus Salem)

101. Implications of Biomedical Technology, Research Review No. 1, Harvard University, Program on Technology and Society, 61 Kirkland St., Cambridge, Mass. 02148, Fall 1968, 53 pp.

This report reviews the social, political, ethical, and legal implications of biomedical science and technology. The review consists of lengthy abstracts "of a small and carefully selected body of literature", preceded by an introductory essay to the field and summary statements with each subdivision of the literature. The topics selected for review -- the subdivision of the literature -- are: national policy for biomedical science (management of R&D and priority setting); health and medical policy (organization and delivery of medical care, and legislating for health); and the implications of biomedical technology (genetic and behavior control, transplants and artificial organs, and drugs and the issue of human experimentation).

(This is the first of a planned series of quarterly reviews; future reviews will treat such topics as technology and occupations, technology and values, and technology and political decision-making).

102. "Technology Assessment Seminar", Proceedings before the Subcommittee on Science, Research, and Development, Committee on Science and Astronautics, U.S. House of Representatives, Ninetieth Congress, First Session, No. 7, (21-22 September 1967), U.S. Government Printing Office, Washington, D.C., 1967, 184 pp.

This seminar was called by Rep. E.Q. Daddario as part of his continuing effort to assess the opportunities and consequences of technology. Broadly, the seminar reviewed current programs in technology assessment (TA) and related areas, discussed mechanisms for performing the assessment, and identified some areas needing assessment. Some ten or so programs related to TA -- mostly university social science programs -- are described by their directors; this is followed by a discussion of such topics as:

- Mechanisms for TA: the need for formal institutions, alternative organizational structures, administrative location of a TA board
- Functions of a TA Board: coordination, public information and education, setting national goals
- Manpower for TA: role of scientist, engineer, and social scientist, multidiscipline approach, and manpower education and supply
- Questions of TA: timing of TA and possible pilot assessment projects

Comments on the seminar are presented by Harvey Brooks, and a helpful summary of the seminar is presented by Irwin Billick of the Science Policy Research Division, Legislative Reference Service.

103. "Technology Assessment", News Release, National Academy of Engineering, 2101 Constitution Ave. N.W., Washington, D.C. 20118, 31 August 1968, 3 pp.

The National Academy of Sciences (NAS) and the National Academy of Engineering (NAE) have each received $25,000 contracts from the House Subcommittee on Science, Research, and Development to study the feasibility of technology assessment. NAE, under its contract, will examine the feasibility of: (1) "identifying social, economic, political and physical consequences (of an action, program or development in technology ...) indicating predictable consequences and areas of uncertainty"; (2) "establishing cause and effect relationships between the action, program or development ... and their consequences"; (3) "identifying action of government that would optimize the sets of consequences, respecting the public interest". NAE will present its findings to the House Science and Astronautics Committee, together with an appraisal of the usefulness of the techniques used, and suggestions for a "technology assessment function suited to congressional use". The subjects selected for the studies are: subsonic aircraft noise as a factor in the growth of civil aviation; multi-phasic health screening centers as a component of the national health care system; television and computers as tools in university level education; selected subjects in ocean engineering. (Draft reports are expected to be available by mid-November).

104. Federal Council for Science and Technology, 1967 Annual Report, Office of Science and Technology, Executive Office of the President, U.S. Government Printing Office, Washington, D.C., 1968, 43 pp.

This, the third report of the Federal Council for Science and Technology (FCST), "is primarily a report of matters considered by the Council" during 1967. It has two parts: the first describes the U.S.-OECD confrontation following the latter's review of U.S. science policy, and briefly discusses the response of the FCST to the report, The Office of Science and Technology, prepared by the Science Policy Division of the Legislative Reference Service; the second, and longer, portion of the report describes the topics taken up by the FCST in its eight meetings during 1967. These include:

- Relations between the federal government and universities
- Technical information dissemination
- Patent and copyright policy
- International affairs
- Scientific and technological priorities

The report includes rosters of membership of FCST committees, and a listing of reports issued by the FCST in 1967. (Previous reports of the FCST activities are: The Role of the Federal Council for Science and Technology, Report for 1963 and 1964, and Activities of the Federal Council for Science and Technology, Report for 1965 and 1966).

105. "Hornig Asks Study of a Science Department", Scientific Research, v. 3, no. 20, 30 September 1968, pp. 9-10.

"The question of creating a federal department of science should be reopened", according to Donald Hornig, the President's science adviser. This re-examination, Hornig believes, "should include the possibility of bringing scientific research and education under one federal roof", with the National Science Foundation at the 'core' of such a department. The department could not "abridge the research programs of mission-oriented agencies"; it "would sponsor basic research, and bring together such science organizations as the Commerce Dept.'s National Bureau of Standards that are not organically related to their parent agencies". "Hornig made it clear that he was not taking a position for or against creation of a big federal science agency but added: 'We have to examine this -- through public discussion, congressional hearings, studies, etc.'" In endorsing Hornig's proposal, Philip Handler (chairman of the National Science Board) stated that 'the time has come to resurrect the idea of a department of science and consider which components of government should be properly placed inside such an agency'. (A similar proposal for a science department has recently been made by Jerome Wiesner, former Presidential science adviser).

106. "Wiesner Urges Super Science Agency", Chemical & Engineering News, v. 46, no. 43, 7 October 1968, pp. 11-12.

The former science adviser to Presidents Kennedy and Johnson, Jerome Wiesner, is now calling for the establishment of a central R&D agency. His proposal, like the similar one recently made by Donald Hornig for a Department of Science, is a reversal of position on a "super science agency" and reflects the difficulties that scientists are now having from cutbacks in federal research funding. But beyond this, Wiesner sees the need for 'more effective mechanisms for planning and managing the Government's scientific activities' and for redressing some of the imbalances in research support that have arisen under 'cold war incentives' (e.g., underfunding of chemistry and the social sciences). Under Wiesner's plan, the "super science agency", with the National Science Foundation at its core, would: sponsor fundamental and applied research; share with other government agencies the support of exploratory research related to agency missions; forecast needs and plan the allocation of resources; and support the universities. Wiesner believes that none of the existing organizations can perform these functions and that only a "higher agency" can 'succeed in re-establishing a proper national priority for science' and 'ensure that the ... capabilities of the nation are adequately and properly focused'.

107. Lambright, W.H., "Government, Industry, and the Research Partnership: The Case of Patent Policy", Public Administration Review, v. 28, no. 3, May/June 1968, pp. 214-221.

"Government patent policy is one of the most troubled issues of the government-industry 'partnership'. Government agencies and departments have a variety of approaches to the technology developed through the 'partnership', and there are therefore a variety of consequences in terms of property rights and commercial value. The diversity in patent policy is principally due to the unique internal dynamics and history of the semi-autonomous administrative subsystems involved in the 'partnership'". The report concludes that an "interdepartmental committee, such as that established under the Federal Council on Science and Technology to deal with patents, is unlikely to be sufficient to combat the centrifugal forces working to maintain diversity".

108. Annual Report on Government Patent Policy, Federal Council for Science and Technology, Office of Science and Technology, Executive Office of the President, Washington, D.C., (June 1967), 1968, 64 pp.

This report, part of the implementation of the Presidential statement on Government Patent Policy issued in

October 1963, reviews recent developments in government patent policy and studies in progress on effectiveness of that policy. The report finds that the policy "has brought about a greater consistency in Federal agency practices". An ongoing study of the policy's impact is described which is aimed at obtaining more information on the utilization of patents developed under government sponsorship. The Council's report introduces, with frequent caveats, statistics on invention disclosures which indicate that federally-financed R&D generates about 4 percent of all patent applications; that NASA, DOD, AEC, and HEW account for about 95 percent of the disclosures of inventions; that contractors account for about 75 percent of all government-financed disclosures; and that the government acquires principle rights to about 80 percent of the invention disclosures received from contractors. Appendices provide further statistical details, a copy of the current overall federal patent policy statement, and citations to relevant agency regulations on patent policy.

(For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 -- Price 35 cents).

109. Bright, J.R. (ed.), Technological Forecasting for Industry and Government, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1968, 484 pp., ($29.95).

Papers and contributions from delegates attending the First Annual Technology and Management Conference, "Technological Forecasting for Industry", held in New York in May 1967, are compiled in this book. It is especially directed to corporate planners, government agencies, and scientists. The state of the art of technological forecasting is outlined in five major sections. Part I reflects the background and development of technological forecasting. Part II explains some of the methods of forecasting, including envelope-curve forecasting, trend extrapolation, and the Delphi method, and discusses problems encountered with these methods. Part III stresses the importance of integrating forecasting techniques with environmental trends. Part IV illustrates some of the uses to which technological forecasting can be applied. The final Part sets guidelines for the organization of a forecasting approach.

110. "Is the NSF on the Way Out?", New Scientist, v. 39, no. 614, 12 September 1968, p. 530.

"Traditionally a conservative science agency charged with filling the gaps and serving as a channel for federal support to all areas of basic research, the National Science Foundation [NSF] is experiencing a severe cut back in money and man-power while Congress and other federal agencies heap more responsibilities and support areas on it". After three years of a level budget, Congress chopped NSF's 1969 budget by nearly 20 percent and reduced its staff to the level of the early 1960's. The decision by the Department of Defense to cease supporting high energy physics, radio astronomy, and other physical sciences obliges the Foundation to take up these high cost projects. Moreover, the Daddario-Kennedy reorganization bill calls for its expansion into applied science and engineering, the social and behavioral sciences, international science research, and education. Observers are concerned that the combination of these new responsibilities and less money to spend will cause the foundation to "lose what little vitality it once had".

111. Gorham, W., "Sharpening the Knife That Cuts the Public Pie", Public Administration Review, v. 28, no. 3, May/June 1968, pp. 236-241.

> "The Department of Health, Education, and Welfare's planning-programming-budgeting system is described. The development of the Department's five-year plan, the plan format, and prospects for improvement are discussed. Difficulties and choices are pointed up and the important but limited contribution of PPBS to HEW programs is stressed. If PPBS is in the end a success, the author concludes, it will not be because it displaces, but because it helps, the traditional political processes". "It can do this, first, by focusing the attention of the political leaders ... on the choices before them; second, by clarifying the implications of alternative courses of action; third, by improving the quality of the debate among those with diverse views about [ends and programs]; and finally, by further ventilating the basis of the choices made among ends and among programs".

112. Keenan, B.R., "High Energy Administration: Big Science Model for the Future", Public Administration Review, v. 28, no. 3, May/June 1968, pp. 250-255.

> "The author asserts that the Atomic Energy Commission's $300 million 200 BEV 'atom smasher' now under construction near Chicago is the first genuine national scientific laboratory developed in this country. He bases the contention on the fact that the accelerator is being constructed and will be operated by the Universities Research Association, Inc., (URA). The article traces the procedure whereby the National Academy of Sciences and the AEC aided 46 universities in creating URA. Since the federal scientific establishment views URA's management of the accelerator as a 'test case' for future operation of high-cost scientific installation, the author concludes that failure of the consortium would diminish the role of universities in directing American science".

113. Roberts, E.B., "The Myths of Research Management", Science & Technology, no. 80, August 1968, pp. 40-46.

> "R&D suffers from a lack of standards of performance, a lack of a true understanding of its process, and a lack of an organized educational basis for its managers. Thus the myths of R&D, and the magic techniques for R&D management. The author says there is need for a factual basis for R&D management and he makes his case by challenging the mythology existing in three areas of R&D -- in decision-making, in information storage and retrieval, and in government R&D contracting. Through these examples, he suggests new directions in which alternatives to present practice may be found. He also advocates that more resources be devoted to 'research on research', pointing out that for all the billions spent each year on R&D, very little support goes toward the study of the total process".

114. Walsh, J., "Medicinal Chemistry: GAO Chides NIH", Science, v. 161, no. 3843, 23 August 1968, p. 769.

> "The General Accounting Office ... issued a report which takes to task the National Institutes of Health, [saying] NIH policies inhibit researchers with grants in medicinal chemistry from obtaining adequate screening and testing services for new compounds they synthesize". [Because of the potential profits involved, NIH "faces problems of greater delicacy with its medical chemistry grants than with grants in other fields:"]. The report deals specifically with NIH research grants in medicinal chemistry, which, in 1967, "amounted to about $13 million and between 1962 and 1967 totalled $53 million". Before a 1962 HEW patent procedure revision, "drug companies had 'routinely made tests ... on compounds developed by grantees ... [acquiring] certain rights to development and marketing'". After 1962, "government could claim title to a compound ... if the investigator received federal funds ... and drug company reaction was to withdraw from cooperation with university investigators". "HEW attitudes on patents have shown a tendency toward liberalization", especially since 1966. "The NIH plan to standardize ... institutional patent agreements and open them to more institutions ... should make it easier for investigators to have compounds tested".

VII SCIENCE, FOREIGN AFFAIRS, AND NATIONAL DEFENSE

102. Mansfield, E. (ed.), Defense, Science, and Public Policy: An Introduction, W.W. Norton & Co., Inc., New York, 1968, 224 pp., ($1.95).

The central public policy issues in the interrelated areas of defense and R&D are discussed in this collection of over 20 previously printed articles. The issues considered in the articles include:

- What are the effects of large defense expenditures on our economy and on our international relations?
- To what extent are large defense expenditures necessary for prosperity?
- To what extent are they a political danger?
- What are the advantages and disadvantages of program budgeting and cost-effectiveness techniques?
- How efficient have we been in developing new weapons, and how can they be further improved?
- How should the federal R&D budget be allocated?

A short bibliography of further readings is included.

103. Foster, J.S., Jr., "The Leading Edge of National Security", Science & Technology, no. 82, October 1968, pp. 13-21.

R&D management in the Defense Department is described by the Director of Defense Research and Engineering (DDR&E). The article outlines how DOD "plans R&D in relation to long-range goals, how programs are defined, how decisions are made, and how military R&D and Congress interact". The mechanisms and procedures for managing the 100 or so large programs and the thousands of small advanced projects are reviewed. This is followed by a description of the budgetary process for allocating the $8 billion budget of DDR&E among the programs and projects and the intermittent interactions with Congress. Some results and plans of military R&D are presented, and the special requirements of Vietnam are cited. Charts showing the R&D policy channels, DOD manpower, and distribution of R&D funds (by mission objective, category of R&D activity, and performer) are included.

104. Garwin, R.L., "Strengthening Military Technology", Science & Technology, no. 82, October 1968, pp. 22-27.

"The author takes a utilitarian view of military R&D, namely that such activities are only desirable insofar as they contribute to our capability in meeting seen and unforeseen threats. Each development should be undertaken with a clear statement of its probable application, with an estimate of savings or a prediction as to improved capability, and with a description of its potential impacts in fields other than the primary one. He believes the introduction of a classified journal of defense research will help defense R&D 'to build on what it has done' and to indicate new directions for possible improvements in military capability. In addition, he suggests that DOD should do more exploratory development, as contrasted with full-scale development, in order to determine 'the limits of the feasible'. He believes that the increased effectiveness of the DOD's exploratory development efforts may depend upon greater autonomy and better education of those who have the capacity to do the exploratory development".

105. Sullivan, L., Jr., "R&D for Vietnam", Science & Technology, no. 82, October 1968, pp. 28-35,38.

"The author heads the office in the Pentagon whose specific purpose is to expedite those R&D activities who hold some promise of increasing the effectiveness of our forces in Southeast Asia. From that special position, he tells of the important role of R&D in the war. Currently, the Department of Defense is investing some $800 million per year in this effort. Given the long time required to bring ideas through the R&D process and convert them to hardware, is it reasonable to expect that today's ideas can be developed in time to have an effect on the battlefield? The Pentagon clearly believes so, citing the more than one hundred new types of equipment that are added to our operational inventory each year. Currently, more than one thousand specific R&D projects are going on in support of the war".

106. Glaser, P.E., et al, Space Technology Transfer and Developing Nations, National Aeronautics and Space Administration, Washington, D.C., NASA Contractor Report, NASA CR-1222, October 1968, 153 pp.

The feasibility of using space-generated technology to meet the technology needs of developing nations is examined in this report. Using Brazil as an example, the study first identified some 40 specific Brazilian needs in such fields as agriculture, public health, industrialization, housing, education and training, and transportation. After evaluating these,"in light of political, economic, and social factors", a search was made for space-generated technology to fill the needs; then mechanisms for transferring the technology were examined. The report concludes that: there is much space-generated technology relevant to developing nations; matching technology with need is only the starting point in transfer; several transfer mechanisms (four are discussed) are potentially effective, but no single one is best; and substantial commitment of resources, by both the disseminating and the recipient nations, is needed for successful transfer.

(For sale by the Clearinghouse for Federal Scientific & Technical Information, Springfield, Va. 22151 -- Price $3.00).

108. "Strong Defense of Research Budget Mustered by John Foster of DOD", Scientific Research, v. 3, no. 19, 16 September 1968, p. 15.

The Defense Department has mounted a determined campaign to protect against further Congressional cuts in fiscal '69 budgets for basic applied research and exploratory development. The House cut $.5 billion from DOD s $8-billion R&D budget request -- a cut DOD officials indicate they could live with -- but the Senate is expected to cut deeper. John S. Foster, Jr., director of Defense Research and Engineering states that DOD R&D in 1968 was at about 70 percent of its 1964 level, allowing for the increased cost of research. "I have become convinced that the net effect of continuing this trend will be a serious weakening of our long-term national security position". Foster is preparing "budget justifications consisting of answers to 50 questions the Senate Appropriations Committee asked ... [including] a list of every DOD-funded r&d project, principal investigator, status and reason for support ... and a status review of the 95 projects under Project Themis". Supporting this effort is an industry study now underway to assess the effects of cutbacks in R&D.

108. Levitt, T., "The Gap Is Not Technological", The Public Interest, no. 12, Summer 1968, pp. 119-124.

The "technology gap" is a gap in "innovation, not creativity"; the gap is in "translating scientific discoveries into market-oriented enterprises, not producing the discoveries themselves. For neither of these activities is the limited size of European markets disabling". In argument with a recent discussion of the gap by Robert Gilpin, the author contends that European management fails to commercially exploit their scientific and technological capability, and that this is the immediate cause of the gap. Several examples of the failure of Europeans to follow-up in the development of marketing are presented to illustrate this failure. But, underlying this entrepreneurial gap is the low social value attached to commerce, which is not regarded as a "fully respectable occupation". Some specific shortcomings typical of European companies are cited: product planning is almost non-existent; few companies have market plans or market research; and financial control systems are rare. The author concludes that Europe needs "a new spirit, led by a new generation of business managers, to capitalize on the knowledge that is abundantly available".

109. Gilpin, R., "Of Course the Gap's Not Really Technological", _The Public Interest_, no. 12, Summer 1968, pp. 124-129.

In replying to Levitt's analysis of the "technology gap", Gilpin agrees that "the gap is managerial". "It is also education, organizational, and attitudinal". But it is even more. The gap "is really a symbolic representation of the whole spectrum of challenges posed by a dynamic, expanding, and socially democratic society for conservative societies ruled by traditional elites wanting the power that science and technology can bring, but unwilling to pay the price of a profound social-economic transformation". But, the prime concern of Europeans, according to Gilpin are: American direct investment in Europe "could reach such a level that the essential decisions affecting the European economy are made in the [U.S.]"; American control of the defense-related industries will cause European countries to "lose their freedom of diplomatic action"; and a "continual brain drain which will deprive European countries of their capacity for autonomous innovation". Three possible strategies for Europe to meet these challenges are discussed.

110. "New Immigration Quotas Affecting 'Brain Drain'", _Scientific Research_, v. 3, no. 16, 5 August 1968, p. 19.

"A sharp drop in the number of scientists and engineers entering the U.S. from technologically advanced nations has already developed in the wake of stringent immigration controls that went into effect on July 1. Under a complicated quota system, few scientists and engineers from Britain, Germany and other developed countries will be allowed into the U.S. for the next two or three years -- and even then entry will be considerably more difficult than it was before July 1. (The latest figures -- for fiscal-year 1966 -- show 8,500 foreign scientists and engineers admitted to the U.S., almost 50 percent of them from Europe.) On the other hand, the system makes entry easier for professionals from the underdeveloped countries and some Administration and congressional officials are deeply concerned about this. Wisconsin Congressman Henry Reuss, whose research subcommittee has taken a particular interest in the situation, says he fears 'a looting of these resources' from countries that can least afford to lose them".

111. "U.S., Soviet Academies Agree on Exchange Plan for New Academic Year", News Report, v. 18, no. 7, National Academy of Sciences, National Research Council, National Academy of Engineering, August/September 1968, p. 16.

An intergovernmental cultural-exchange agreement has been negotiated by the National Academy of Science and the Academy of Sciences of the U.S.S.R. The new agreement provides for 180 man-months of visits over a two-year period, which is an increase of 10 months from 1966-67 and a return to the level of exchanges in 1964-65 and before. Other changes from the 1966-67 agreement include: "a provision whereby lecture visits by academicians and other distinguished scientists may be proposed by the receiving Academy and not merely designated by the sending Academy; and a multilateralization of what had previously been called 'joint symposia' and which are now called 'jointly sponsored' symposia to indicate that while the organization of the symposia will remain in the hands of the U.S. and Soviet Academies, the participation is to include scientists from three countries".

112. Swanson, R.W., Information: An Exploitable Commodity, Air Force Office of Scientific Research, Office of Aerospace Research, United States Air Force, Arlington, Va., AFOSR 68-0652, April 1968, 65 pp.

This paper (presented at the Fourth National Congress on Data Processing, held at the Hebrew University, Jerusalem, Israel, 8 and 9 April 1968) takes the "viewpoint that information systems are rapidly becoming a necessity for growing technology-based economics". The paper "reviews studies that report on how information has been and can be communicated for its exploitation. It discusses various types of systems and schemes that have been developed to aid the information transfer process ..." Hardware and software (including human) limits and constraints are considered, and an "information facilities network is suggested as a structure for providing necessary documentation, transmission, and use of information". "Information activities are related to payoff, particularly with respect to technologically developing societies and potential small-industry users". A bibliography of bibliographies dealing with "information transfer and the technological exploitation of knowledge" is included.

113. "DOD Takes Policy Stand on 'Protesting' Researchers", Washington Science Trends, v. 20, no. 24, 23 September 1968, p 1.

The Defense Department (DOD) has asked researchers who criticize government policies in Vietnam to 'reexamine' their interest in receiving government research funds. "The official policy statement follows several less subtle 'reminders' addressed by Army and Navy research managers to several mathematician-contractors who urged their colleagues not to 'put mathematics in the service of this cruel war'". In an effort to avoid further deterioration of DOD-scientific community, Director of Defense Research and Engineering, John Foster, issued a clarifying memorandum directing DOD research contract management to avoid emphasizing 'nontechnical issues' in deciding whether to renew or terminate contracts. 'These are subtle issues which require careful, consistent and sensitive treatment. Clearly, some members of the R&D community have disagreed with governmental decisions, while they contributed significantly to the country". [Touching off the dispute was an announcement in the August Notices of the American Mathematical Society urging mathematicians to 'regard yourselves as responsible for the uses to which your talents are put'; 'this responsibility forbids putting mathematics in the service of the cruel war'].

114. "Chemical Survey in Vietnam Planned by University and Industry Scientists", Scientific Research, v. 3, no. 16, 5 August 1968, p 15.

"The Society for Social Responsibility in Science plans to send a team to Vietnam later this year to gather information on the effect of chemical warfare on that country's ecology. If it can raise the funds, the Society plans to send an ecologist, a biochemist, and an agricultural engineer for two to three weeks ... The Society is now applying to foundations and federal agencies for help and is gathering funds from its 800 members...The Society hopes its report will act as a catalyst to the American Association for the Advancement of Science ... which considered a similar mission to Vietnam some 18 months ago but dropped the idea. Instead, the Association asked the Dept. of Defense to conduct a survey. No field survey was made, but a literature survey was completed by the Midwest Research Institute. In addition to its own quick three-man field survey, the Society hopes that either the Association, a foundation, or an agency of the United Nations will conduct a "well-funded, well-planned" and thorough survey of Vietnam's ecology".

115. "Navy Cuts", Science, v. 162, no. 3849, October 4, 1968, p. 101.

"Scientists and engineers are likely to be among those fired as a result of the Navy's nationwide economy program, aimed at cutting 2400 jobs and saving $12 million in the Navy's 15 nationwide research laboratories. Navy officials say that each laboratory will determine which employees will be affected, and a national computer center will try to match dismissed persons with new jobs in industry and government. The reduction is part of the Defense Department's drive to cut fiscal 1969 expenditures by $3 billion".

116. "Defense Dept. Will Cut Back Foreign Research 60 Percent by Fiscal 1970", Scientific Research, v. 3, no. 19, 16 September 1968, pp. 17-18.

Overseas research funded by the Department of Defense will be cut to $5.3 million in fiscal year 1969, and to $3.7 million in 1970. These reductions, down from $11.8 million in 1966, "will force a consolidation of overseas offices and a reduction in administrative personnel". By 1970, the Army research office in Frankfurt, Germany and the Air Force office in Brussels will be consolidated in the Navy office in London; research project managers stationed in Europe to monitor R&D programs will be reduced from 144 to 53. "In retrenching on overseas research, John S. Foster, Jr., director of Defense Research and Engineering, is preparing a new set of guidelines for the selection of projects to be funded". "In general, there will have to be a compelling reason for projects to be conducted abroad rather than in the U.S.", such as dependence on specific geographical location.

117. "NIH: End of an Era for Foreign Support", Scientific Research, v. 3, no. 17, 19 August 1968, pp. 25, 27-28.

The National Institutes of Health (NIH) is taking an increasingly less active role as a supporter of international biomedical research. From 1964 to 1967, NIH funding dropped from $25.6 million to $20.1 million and the outlook is even more bleak for 1969. This decline reflects a number of changing factors, both internal and external to the U.S. One possible consequence of this policy, according to Heinz Specht, director of NIH's Office of International Research in Paris, will be a shrinking of the exchange of scientific ideas between U.S. scientists and their foreign counterparts. Although some scientists may deplore the new policy, the NIH contribution to research is not as critical now as it was in the 1950's. At that time NIH support was indispensable to the research programs of many countries still recovering from the impact of World War II. This latter factor, combined with internal criticism of NIH for its support of foreign research, augurs a continuing decline of U.S. participation in this field.

118. "Fogarty International Center", Science, v. 161, no. 3841, 9 August 1968, p. 552.

"Funds for the John E. Fogarty International Center for Advanced Study in the Health Sciences have been appropriated. The center, which will be directed by Milo D. Leavitt, Jr., former director of the National Institutes of Health Office of Program Planning, will house an international conference and seminar program, a scholars-in-residence program, a foreign visitor center, and an international fellowship and exchange program. Named for the late Rhode Island Congressman John E. Fogarty who had long supported plans for the creation of an international health sciences study center, it will cost about $3 million and operate within existing NIH facilities until its construction is completed in 1972".

119. Calder, N., "Space Techniques for Poor Countries", New Scientist, v. 39, no. 612, 29 August 1968, pp. 445-446.

The first United Nations Conference on the Exploration and Peaceful Uses of Outer Space was held in Vienna in mid-August. Its purpose was to examine how space technology could be used in underdeveloped nations. "Although it took years for the USA and USSR to agree on the date for the conference, it has proved to be timely in 1968, because satellite communications and meteorology have reached the point when fully proved systems can be offered to the world". This article reviews some of the events of the conference, in particular the reports of the Brazilian and Indian representatives on how they are using and plan to use space technology in education and resource surveying. "For smaller developing countries, the task of organizing serious space studies is plainly difficult and some kind of regional pooling of effort will be needed". Relatedly, the 'implications of domestic space activity should be thoroughly explored before committing resources or personnel to them'. "It takes years to get scientific or practical results" from space R&D.

120. Busiuk, V., "Marine Resources Development, Foreign Policy, and the Spectrum of Choice", Orbis, v. 12, no. 1, Spring 1968, pp. 39-72.

"For the past two years, divergent tendences have characterized marine science affairs. On the one hand, there have been a number of important developments which aroused great expectations". "On the other hand, actual progress in marine development ... has not matched these expectations". This comprehensive article first discusses the considerations involved in making a major national commitment to marine R&D: competition for resources from other programs, the cost-benefit of marine exploitation, foreign policy implications, and different approaches -- national, international, and regional -- to marine affairs. The second section deals with the current debate over the "regime of the oceans" and discusses the role of the United Nations, demilitarization of the deep ocean areas, and the policy implications of advancing technology. The third and final section discusses priorities in marine policy and programs. Among the many conclusions and recommendations presented are: the fact that the U.S. has a commanding edge in marine technology "does not guarantee that it will be the greatest beneficiary in the development of marine resources"; "in evaluating marine development in competition with other claimants for national resources, the timing of the initial investment should be carefully considered" ("marine programs do not require large funds at the outset", but "time-consuming negotiations with other nations" may jeopardize programs); although the present options for the U.S.'s role in marine development are broad, "the range of choice may be narrowed rapidly by a determined developmental move in ocean exploitation" by other nations. "Thus, it is important to establish an institutionalized national capacity for continuous appraisal of the potential offered by the oceans"; this "institutional capability is the single most important factor in assuring to the (U.S.) the widest possible freedom of choice".

121. "East Europe Exchanges", Science, v. 161, no. 3849, 20 September 1968, p. 1227.

"Recent political developments in Eastern Europe notwithstanding, the National Academy of Sciences (NAS) has announced that applications are open for the NAS Soviet Eastern European exchange program. Under the existing agreements, NAS, in cooperation with the Soviet Academy and the academies of sciences in Czechoslovakia, Poland, Romania, and Yugoslavia, offers 1- to 12-month visits during the 1969-70 academic year to American scientists interested in current scientific research in Eastern Europe and the Soviet Union".

VIII SCIENCE POLICY IN FOREIGN COUNTRIES

186. Science Policy and the Organization of Scientific Research in the Socialist Federal Republic of Yugoslavia, Report No. 9, United Nations Educational, Scientific and Cultural Organization (Unesco), Place de Fontenoy, Paris-7^{e}, 1968, 121 pp., ($3.50).

This report, undertaken by the Federal Council for the Coordination of Scientific Activities, is a study of science policy and research organization in Yugoslavia. The report is divided into six parts: historical survey of scientific research in Yugoslavia; current administrative organization of scientific activities; funding and expenditure on research; technical manpower and utilization; objectives of policy for science and technology; and annual socio-economic factors related to objectives and policies. Extensive statistical data are presented, as well as an 11-item bibliography on other Yugoslav science policy documents.

187. Marine Science Activities of Canada and the Nations of Europe, Africa, Latin America, East Asia, and the Near East and South Asia, National Council on Marine Researces and Engineering Development, April 1968.

The National Council on Marine Resources and Engineering Development has published surveys of the marine science activities of 99 nations. The survey was prepared to assist policy officials and specialists concerned with developing their domestic programs and planning for expanded cooperation with other nations. The survey is reported in five volumes, with one volume for each geographical area. The contents of the survey include: a brief description of the economic importance of marine activities to each country; mechanisms for coordinating ocean endeavors; and the nature and scope of marine research. For each country the organizations and directors of the marine science programs are listed.

(All volumes are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. "Canada and Europe" - 55 cents; "East Asia", "Latin America", and "Africa" - 35 cents each; and "Near East and South Asia" - 30 cents).

188. International Statistical Year for Research and Development, A Study of Resources Devoted to R&D in OECD Member Countries in 1963/64, Statistical Tables and Notes, Organization for Economic Cooperation and Development, Paris, June 1968, 396 pp., ($5.50).

> This report presents the most complete statistical data available on 1963-1964 R&D expenditures and manpower for 17 OECD nations. The report, which is part of the International Statistical Year (ISY) effort, is "essentially a compendium of data submitted by member countries, together with explanatory notes designed to clarify national particularities and certain problems ... which impede international comparability". (In connection with the latter, the report includes two chapters, one on the "International Comparability of the Results of the ISY", and another on "The R&D Exchange Rate"). Separate sections of the report are devoted to the "Business Enterprise Sector", "Government Sector", "Private Non-Profit Sector", and "Higher Education Sector". (An earlier volume in this series was released in September 1967, "The Overall Level and Structure of R and D Efforts in OECD Member Countries". Copies of both reports can be obtained from: OECD Publications Center, Suite 1305, 1750 Pennsylvania Ave. N.W., Washington, D.C. 20006).

189. Scientific Policy, Research and Development in Canada, Prepared by the National Science Library, National Research Council of Canada, Ottawa, 1968, 72 pp., ($1.00).

> This bibliography, prepared by the National Science Library of Canada, cites over 300 publications which discuss science policy and the role of scientific research and development in Canada. The material covered dates from 1935 to July 1968 and includes reports, periodical articles, government documents, and official speeches. (Periodical articles tending to be "journalistic" rather than "authoritative" are not included). The material is classified into eight categories: R&D in the federal government, R&D in the provinces; R&D in industry; R&D in universities; manpower; scientific and technical information; research summaries; and general.

190. Piganiol, P., "Scientific Policy and the European Community", Minerva, v. 6, no. 3, Spring 1968, pp. 354-365.

> The author discusses problems associated with attempts to close the technological gap between the United States and the Common Market Countries. The problems include duplication of effort, the attainment of a "critical mass" needed for successful research, the lack of a coherent set of definitions for basic research, applied research

and development, the role of government, contract research, and international cooperation. The author proposes the establishment of a European Science Foundation which would perform some of the following tasks: (a) maintain a survey of research technology; (b) maintain a survey of the state of both established and emerging disciplines; (c) maintain a "clearing-house" for all current research programs; (d) make quantitative studies of the scale, organization, and direction of research in the countries of Europe, the U.S. and the Soviet Union; and (e) study and evaluate different forms of international cooperation.

191. "ELDO: Last Spasms or New Hope?", New Scientist, v. 40, no. 218, 10 October 1968, p. 63.

An ELDO Ministerial conference was held in Paris during the first week of October; this brief article summarizes the proceedings. "The crisis over the European Launcher Development Organization ... transcends its own rather niggling financial problems". "It has become a main arena for the debate on a European technological community linking the EFTA countries with the Six". "No conclusion was reached last week on either the immediate or ultimate problems. One more committee of experts was set up to consider Europe's long-term space needs -- this time without British support and without the time to do a proper job. It must report in a month". "There was, however, a consensus among European ministers of science and technology in favour of linking the independent European space launcher effort with other advanced technology work in Europe ... and of providing a Europe-wide framework for closing the circle: European consortia for production and common government procurement policies to market the products". If "serious moves towards a European technological community were made, Britain was prepared to relax her rigid position over further financial contributions to keep the ELDO rocket alive".

192. "CERN: Dampened Optimism -- But No Defeatism", Scientific Research, v. 3, no. 17, 19 August 1968, pp. 33-36.

Bernard P. Gregory, Director-General of CERN, believes that the proposed 300 GeV proton accelerator will be built in some form -- perhaps one of initially lesser energy -- despite Britain's withdrawal from the project. An alternative plan is to be considered in October, but the participating nations are asking whether the program for such a machine is adequate in view of the U.S. 200-400 GeV accelerator. Several years ago, European scientists gauged the interests of the U.S. and the USSR in joining the 300 GeV accelerator program. The response was negative. Far in the future lies the possibility of a truly international effort to build and operate one capable of 1000 GeV.

193. Reed, L., "Pooling Europe's Sea Resources", New Scientist, v. 39, no. 608, 1 August 1968, pp. 231-232.

> "Britain with nearly a third of the European continental shelf should take the lead in setting up an Oceanic Development Commission [ODC] to administer the whole in the interests of marine science and technology". The future role, functions, and funding of such a Commission are discussed. The ODC role would involve coordinating and promoting "an accelerated, long-range programme" in marine science and technology. Some of the functions would include: 1) encouraging private investment in technological developments through loans and contracts, 2) fostering ocean technologies by initiating a major venture, 3) broadening marine education, and 4) regulating industry on the environmental shelf, etc. The principal source of funds would result from the 'development value' -- "namely, the sale of exploration licenses and production leases, and the royalities flowing from the exploitation of marine resources ... [T]axes levied by member states on companies' profits".

194. "New Center for Educational Research and Innovation", SSF Newsletter, v. 3, no. 5, August 1968, p. 7.

> This article announces OECD's plans to set up a center in Paris for educational research in member countries. The Ford Foundation has given a grant of $1 million to assist in the establishment of the Center. The purpose of the three-year program is to provide a framework within which major changes in educational systems can be shared among nations. The program will concentrate on two educational needs: the democratization of educational opportunities and the modernization of structures, curricula, and teaching methods. Mr. James R. Gass, OECD Deputy Director for Scientific Affairs is Director of the program.

195. "Science and Technology in Asia", SSF Newsletter, v. 3, no. 5, August 1968, p. 7.

> A Conference on the Application of Science and Technology to the Development of Asia was convened by Unesco during August in New Delhi. Topics of the conference included: "(1) prerequisites for the application of science to development; (2) the improvement of science education at all levels; (3) the needs and possibilities for scientific manpower and finance required for scientific research and development, and (4) science policy and its relation to economic planning". The countries that participated were Afghanistan, Australia, Burma, Cambodia, Ceylon, China, France, India, Indonesia, Iran, Japan, Republic of Korea, Laos, Malaysia, Mongolia, Nepal, Netherlands, New Zealand, Pakistan, Philippines, Singapore, Thailand, USSR, UK, USA, and Republic of Vietnam.

196. "A Model for Asian Science Policies", New Scientist, v. 39, no. 614, 12 September 1968, p. 532.

This article discusses a science policy model and some recommendations which emerged from the first ministerial-level Conference on the Application of Science and Technology to the Development of Asia (CASTASIA). The model "provides a tool linking educational planning, scientific and technical manpower supply and R&D activities". It uses a series of algebraic equations to describe the effects of manpower supply and costs and to identify their parameters and interrelationships. Recommendations included: 1) By 1980 a spending level of at least 1% of the total gross national product on R&D should be reached; 2) Areas that should be given priority include: "promote appreciation of science by the common man, improve science education, encourage recruitment and training of middle-level technicians ... develop agricultural education ... strengthen and foster scientific research and technological development"; 3) Formulate and implement a national science policy and promote international and regional cooperation.

197. "Where Does Australian R&D Money Go?", Scientific Research, v. 3, no. 17, 19 August 1968, p. 21.

"The new Australian Department of Science & Education will investigate government and private r&d spending to determine how much money is spent, where and on what". This study comes as a result of requests by scientists for more government research support and for a national science policy. The Department -- set up in 1966 under John Gorton who is now the Prime Minister -- "has been limited primarily to supporting the Australian Research Grants Commission ... which distributes $33 million annually ... mainly to universities". "The Commission has been accused of favoring scientific and industrial over the arts and economic research" and criticized for "showing bias towards senior scientists and university department heads". (The total Australia spending on R&D is estimated at less than 1 percent of the gross national product).

198. Vig, N.J., Science & Technology in British Politics, Pergamon Press, New York, 1968, 190 pp.

The author examines and assesses the political controversy and reforms which occurred in British government policy during 1959-64 regarding the support and advancement of science and technology. This is accomplished by presenting a detailed survey of policy developments in the civil (non-military) science field and the associated controversy over science policy, as a case study of 'general' British political processes. The survey of policy developments includes: summaries of programs and underlying problems before 1959, policies under the Conservative Government of 1959-64, and recent developments under the Wilson administration. The analysis of the "science policy debate" is put in an "overtly 'political' framework, emphasizing partisan and group differences". It includes: analyses of the aspects of the political climate during 1959-64 which contributed to the "'politicization' of science, as well as internal pressures for reform"; analysis of the contrasting approaches of the Conservative and Labour Parties; and discussion of the role of Parliament and interest groups in science policy-making.

199. Bessborough, The Earl of, "The Wrong Structure?", New Scientist, v. 39, no. 616, 26 September 1968, p. 653.

"The closer links between science and industry which Britain required have not been provided by the new Ministerial and other bodies that the Labour Government introduced". The author, Parliamentary Secretary for Science 1963-64, feels "the shortcomings lie partly in the official structure, which has been created and partly in lack of confidence in those currently responsible for policy". After briefly reviewing the government history since 1963 and presenting "the picture as a whole", he asks three questions which are prompted by the present set-up in government: 1) Does the split between 'science' and 'technology' "promote confidence and a sense of getting somewhere? Does it not inhibit the Council for Scientific Policy, limited as it is to advising on only about seven per cent of the nation's total R and D expenditure?", 2) Is the "government not being hypnotized by size as a criterion of effectiveness in industry? Should not the governmental research establishments be more closely linked not only with the universities but also with their relevant industries?", 3) Is "adequate thought ... being ... given to the priorities of the future? Is there not an obvious case for better handling of our policies (if they exist) on space?"

200. Blackett, P.M., "Memorandum to the Select Committee on Science and Technology", Nature, v. 219, no. 5159, 14 September 1968, pp. 1107-1110.

The author, who is President of the Royal Society, proposes some national policy guidelines for R&D in the manufacturing industry. After reviewing British expenditures for R&D and noting their relationship with economic growth (the highest expenditures -- nearly 3 percent of GNP -- and one of the lowest economic growth rates in Europe), Blackett reviews the "innovative chain" from research to marketing, and the relative costs of different links, with the conclusion that R&D is about 10 percent of the total. He then shows "how one can calculate the minimum size of a firm which can manufacture successfully an advanced product requiring heavy

R and D". The implications of these arguments are then applied to government policy, first in relation to civil industry and then in relation to defense industry. (Among the recommendations made are: government funds should be used to promote firms "able to carry out their own R&D and take a project to a commercial and export success" and to bring into being more "first-class firms"). Beneficial side-effects in management and brain-drain reduction are discussed. Finally, as to where R&D should be done -- government station or private firm -- Blackett recommends that "when an R and D project intended to lead to a manufactured product is being considered for Government support, it should be easier to fund it in a selected firm than it has been at a station".

201. "British Veto 300 GeV", Bulletin of the Atomic Scientists, v. 24, no. 7, September 1968, p. 31.

This is the official British statement vetoing participation by the United Kingdom in the $414-million project for a European laboratory to house an accelerator of 300 GeV. It reads, in part: 'My government have now decided, in the light of other commitments, that expenditures involved on this very large project would not be justified. Her Majesty's government regret this decision because they fully appreciate that the project is well conceived and that strong scientific views have been expressed in its favor. But they are satisfied, after an exhaustive review of the arguments, that they should not enter into this commitment. In reaching this conclusion, my government have had in mind that through CERN, which they will continue to support, the European high-energy nuclear physics community already has an important project in hand in the Intersecting Storage Rings. This will give European physicists a unique instrument which will enable some further advances to be made in the physics of very high energies'.

(For a sample of British reaction to the decision, see Nature, v. 219, 6 July 1968).

202. "Proposed British Bubble-Chamber Could Take U.K. Back Into 300 GeV", Scientific Research, v. 3, no. 19, 16 September 1968, p. 21.

"Although Britain has withdrawn from the CERN's 300-GeV accelerator, plans are afoot in Britain to build a bubble chamber with an unusually high magnetic field that could be used with the big European machine -- a possibility that could pave the way for British re-entry into the project". "The chamber would cost $4.4-7.2 million (depending on the magnet costs) and take four years to build". "The 300-GeV project is still on the rails despite Britain's withdrawal". "If Britain re-enters the project, CERN observers believe that her outlay for the bubble chamber and

2

an offer of its use to CERN would be credited against the money the U.K. would otherwise owe CERN as of the time the machine goes into operation -- about 1972". "However, British withdrawal from the project has upset the U.S.'s high-energy physics program and it is likely that the Science Research Council, which finances high-energy physics, will wait until it hears what form the 300-GeV project will take before it decides about the ... bubble chamber".

203. "British Universities Handed More Cuts", Scientific Research, v. 3, no. 19, 16 September 1968, pp. 19,21.

British universities were recently notified by the University Grants Committee that "there will be no government funds for construction over the next year and that a cut of 5 percent will be made in the $46 million already allocated for equipment during fiscal 1968-69". The cuts, forced by last year's devaluation, are an effort of the government to reduce public spending by $700 million. The university cuts will save the government about $36 million, which would have been used for scientific laboratories and equipment. The universities are "predictably unhappy" with the latest government move since only last year they were in financial chaos by a change in government funding methods. One vice-chancellor remarked, "This is the last straw -- one just cannot rely on the government's word. This prevailing uncertainity is going to force universities to commit the government in advance by spending all available money as soon as it appears".

204. "Fellowships at Home", Nature, v. 220, no. 5163, 12 October 1968, p. 109.

The United States-United Kingdom Educational Commission announced that Fulbright Travel Grants will not be offered in the academic year 1969-70. Congress cut the programme funds by an overall 30 percent, from $46 million to $31 million. "Though voices have been raised in Congress criticizing Fulbright exchanges on the grounds that they encourage the mobility of dissidents, the motives for the cutback ... seem straightforwardly economic". Although money for American scholars to travel abroad was cut by 70 percent, the U.S. funds for grants suffered only a 20 percent cut. As a result, the State Department is "trying to maintain the flow of grants towards the poorer nations at the necessary expense of the richer". Consequently, the British end of the programme was cut drastically from $860,000 in the current year to $170,000 in the next. Out of this sum must come salaries for the staff of the Commission, money for a schoolteachers interchange programme, and funds to maintain scholarships. Since the remainder of the $170,000 would only support "a derisory exchange programme", it was decided it would be better to cancel the 1969-70 programme altogether.

205. "No Policy Here", Nature, v. 220, no. 5163, 12 October 1968, p. 114.

The Social Science Research Council of Great Britain has recently published a compilation of reviews by leading social scientists, intended to guide the council in its future policy. The publication includes information on current research developments, likely developments in the future, research needs in terms of manpower, money and other resources, and research organizations. Problems facing social scientists and how these can be solved are also discussed. Some of the problems include: 1) little time to spend on research compared with teaching time, 2) very little 'intellectual contact' with other workers, especially abroad, 3) need for interdisciplinary research. "Among suggestions ... is that there should be set up research units for social scientists, with emphasis on research rather than on teaching, in which people from various disciplines could put their heads together over the solving of problems". In conclusion, "opportunities for research in automation, international organization, political science, social anthropology and poverty have been considered ... however ... few tangible policies emerge".

206. "Is There a Future for Technology?", Nature, v. 219, no. 5161, 28 September 1968, pp. 1305-1306.

"The report of the Working Group on Manpower for Scientific Growth under the chairmanship of Professor M. Swann, published on September 25 (HMSO, 17s.6d.), makes sober reading. If industry is to attract technically qualified people in the numbers which the national interest demands, there will have to be a radical re-examination of the whole educational system ... The aims of the British educational system, at least as far as science and technology are concerned, should be to produce people well prepared for their prospective employment -- especially in science-based industry and schools -- and to produce people willing, even eager, to work in industry and the schools. The report says that the present educational system manifestly fails in the second of these aims and may well be failing in the first". This article reviews the major findings and recommendations of the Swann report. Some of these are: the annual output of scientists will grow at less than 5 percent, compared with the recent 10 percent growth; British industry needs more graduate scientists and technologists; "PhD training should be more closely geared to industrial problems without decreasing intellectual content"; and the British educational system "is devoted to specialized rather than generalized education" -- the system "will have to move towards the American pattern of a broad first degree followed ... by post-graduate specialization".

207. Rudd, E., "The Rate of Economic Growth, Technology and the Ph.D.", Minerva, v. 6, no. 3, Spring 1968, pp. 366-387.

This paper summarizes an investigation into postgraduate education in Britain carried out by the author's research group. The results are based on an interview survey of nearly 1000 current graduate students, a postal survey of everyone who began postgraduate education in the academic year 1957-1958 and numerous interviews with university teachers of science. On the basis of this investigation, the author concludes that "the opportunity cost of strength in pure science can be weakness in technology", and that "the adequacy of the supply of trained manpower of high ability is of greater importance to economic growth at the applied end of the spectrum of research, development, and innovation than it is at the pure research end". The statistical data are summarized in nine tables. The author concludes that "Britain's contribution to pure science is so far beyond what she can afford that even after a sharp shift of effort away from pure science, Britain could still be making a contribution to the advancement of science that would be large in relation to her size and wealth".

208. "Britain and International Scientific Co-Operation", Her Majesty's Stationery Office, London, England, Central Office of Information Reference Pamphlet 81, 1968. 65 pp.

"This pamphlet, after outlining the historical background, describes the broad framework within which Britain's international scientific relations are conducted and Britain's contributions to some of the better-known international scientific organizations". Both government and non-government cooperative programs are described, as well as cooperative relationships between British university departments and those of foreign countries, and international technological projects. The financial contribution made in 1966-67 to some of the major international scientific organizations is also presented.

209. "British-Italian Collaboration", Nature, v. 219, no. 5161, 28 September 1968, p. 1303.

The Royal Society and the Accademia Nazionale dei Lincei of Rome are engaged in discussions "to consider possible ways of increasing scientific cooperation ... which might be of scientific and economic benefit to both Italy and the United Kingdom". Special efforts are being made to expand the fellowship program between the U.K. and Italy and "to make the active centres of research in Italy better known in the U.K." It has been suggested that British and Italian scientists who have good plans for collaborative projects should submit their grant applications simultaneously to the Science Research Council and the Consiglio Nazionale delle Richerche respectively". Areas of research which have been "singled out for encouragement" include: astronomy, biomedical engineering, computer software, and polymer engineering. It was suggested that a European scale study be conducted to study the needs of scientific research in both physical and biological sciences for electronic equipment.

210. "A Canadian Policy for Research and Development", The Engineering Institute of Canada, Montreal, Canada, March 1967, 35 pp.

This report, presented by the Engineering Institute of Canada, proposes a new Canadian policy for research and development. It first discusses the principals on which the proposed policy for R&D is based and the present condition of Canadian R&D, and then presents recommendations for a national policy. An appendix presents detailed supporting material for the recommendations. A few of the many recommendations made include: 1) "Canada should pursue a national research policy as follows: (a) Attain the same proportionate research and development spending as in leading countries, but with emphasis on industrial research and development ; (b) Increase direct government support to applied research and development in industry; (c) Provide research funds separately from teaching funds "; 2) "Support of applied research and developmental be given first priority"; 3) "National research and development investment be guided into a distribution of 10% to basic research, 30% to applied research and 60% to development"; 4) "Priority be given to the support of research and development for the science based industries"; 5) "A national computerized technical information center be established ... with an annual budget of 3% of the federal Research and Development budget".

211. Science Forum, A Canadian Journal of Science and Technology, v. 1, no. 4, August 1968, 33 pp.: v. 1, no. 5, October 1968, 34 pp.

This new bi-monthly journal is a prime source of information on Canadian science policy matters. Feature articles on this topic appearing in the two most recent issues are listed below.

Number 4:

"A Technological Strategy for Industrial Progress in a Competitive World"
"A Closer Relationship Is Needed Between Universities and Industries"
"Industrial Research Needs National Goals, Not Fragmented Support"
"The New Field of Science Affairs: Views of Eight Experts"
"Wanted: A New Unit on a Canadian Campus to Study Science Policy"

Number 5:

"Science and Technology in Developing Countries"
"Lessons From India in Introducing Science to Ancient Civilizations"
"How Canada Can Help New Nations to Develop a Personal View"
"Science and Technology as Vital Ingredients in Cultural Change"
"Is the Science Council on the Right Track? A Critical Inquiry"

(Subscription and inquiries should be addressed to Science Forum, University of Toronto Press, Toronto 5, Ontario -- Cost: $6.00 per year).

212. "Canadians View Future", Chemical & Engineering News, v. 46, no. 42, 30 September 1968, p. 13.

> "Canada is putting between 25 and 30 cents of its research dollar into chemistry and chemical engineering. However, growth is lagging. For the next four years increases in industrial R&D expenditures in these chemical areas will do little more than keep up with growing costs ... Dr. J. R. Weir, director of Canada's Science Secretariat, said that the mission spent at least $180 million on chemistry and chemical engineering R&D in fiscal year 1966-67. Total national R&D expenditures for the 12-month period were about $760 million ... Of the operating expenses, 27% came from the federal government, 60% from industry, 6% from the universities, and 7% from all other sources ... The projections the secretariat has on hand for future chemical research expenditures are disturbing, Dr. Weir warns. The average growth rate for operating expenses from 1966-67 to 1970-71 will be 9.7% per year. But for industry, the biggest sector, the growth is projected at 7.0%. This is only slightly above the 6% annual growth needed to account for inflation and increase sophistication and to keep the research at its current level. Government in-house research operating expenditures are expected to grow at 11.5% per year. University research will do better with a 16.7% annual growth rate".

213. "Institutions of Higher Education, Research, and Planning in Columbia: Background Information for Columbia -- U.S. Workshop on Science and Technology in Development", National Academy of Science, Washington, D. C., 1 March 1968, 65 pp.

> "This report contains information on Columbian institutions of higher education (Part I) and institutions engaged in research and planning for economic development (Part II), extracted from the sources listed in the bibliography. Part I describes the twenty-five member universities of the Columbian Association of Universities, the School of Public Administration and the School of Administration and Finance. Included are dates of establishment, names of rectors and deans, faculties, budgets, and numbers of professors and students. The institutions described in Part II have been grouped by field as follows: Science Promotion and Planning, Agriculture, Education, Industry, Medicine and Public Health, Natural Sciences, Planning for Economic Development, and Social Sciences. The descriptions include the name of director, date of establishment, budget, and information on the institution's objectives, structure and activities. Because of the broad nature of this report, the listing is by no means complete".

214. Nekola, J. and Zelinka, J., "Research and Development in Czechoslovakia", Minerva, v. 6, no. 3, Spring 1968, pp. 388-397.

> "The efforts to utilize the results of scientific research in economic life have rendered it urgent to elaborate a system of indicators which would permit the assessment and comparison of the scale and structure of research and development activities". The "R&D base" -- the complex of institutions doing R&D -- is briefly described, and various data on expenditures and manpower are presented. The data include expenditures over the 1960-1966 period, by performer and source of funds, capital investment, manpower (with projections to 1970), and the distribution of manpower among R&D performers. Some of the problems of relating these data to corresponding data of capitalist countries are discussed. The author concludes that "one of the most urgent tasks is the establishment of uniform methods of collecting and presenting [R&D] statistics which will ... permit comparisons of socialist countries" with each other and with capitalist countries.

215. Kenton, J. E., "Czech Science -- and Then the Russians Came", Scientific Research, v. 3, no. 20, 30 September 1968, pp. 20-25.

> Before the August invasion, the Czechoslovak Academy of Sciences planned a reorganization of the country's

science establishment. Among the most important reforms considered were: Autonomy of the universities and control of their own scientific programs; recognition of the Slovak Academy of Science as "top scientific center of Slovakia"; "improvement of the performance and organization of both Academies". The reorganization was proposed partially to unite scientific fields in solving interdisciplinary problems, such as water pollution and urbanization. Most scientific problems in Czechoslovakia center around the technology gap ..." "Our scientific base is high, but our technology base is much lower, so we have a gap. As a result, some of the results of our science can be applied quickly in Western cultures and in the Soviet Union, but not here". In 1967, 3.7% of the Czech gross national product was spent on science, however, their GNP measurement ground rules differ from those of the West. A brief description of the Czechoslovak Academy's present management organization and other proposed changes are presented.

216. "France Seeks Computer Freedom", Industrial Research, v. 10, no. 9, August 1968, p. 30.

"France's moribund domestic computer industry" is discussed in terms of problems and actions being taken to counteract these problems. The problem: "If French companies do nothing, the proportion of microcircuits made with U.S. capital in France will grow from 60% in 1967 to 90% in 1970" -- "a serious threat to France's 'independence' in technology". To counteract the American threat, "Plan Calcul" was conceived to resurrect France's computer industry. The following projects are in effect: "Plan Composants" to stimulate mergers between subsidiaries of major European groups, "such as CSF, Radiotechnique-COP-RIM (Philips) ..." and to encourage the growth and development of domestic electronic components industry; SPERAC group -- a joint venture of the Compagnie des Compteurs and Thomas-Houston -- to encourage independence from outside countries for peripheral equipment". $187.5 million is earmarked for Plan Calcul -- "the cost will probably be a lot more". Although a "more reasonable solution would be vigorous, whole-hearted cooperation on a European scale", "no successful 'independent' European computer group can exist without "the new British computer corporation", and the computer effort of the $1,920-million Dutch Philips electronics combine".

217. "Italy's Ministry of Research Faces Extinction; Reforms Will be Deferred", *Scientific Research*, v. 3, no. 16, 5 August 1968, p. 17.

"Italy's infant Ministry of Research & Technology may die a swift and largely unmourned political death. The Ministry which achieved cabinet status less than a year ago, was to have directed all government-financed scientific research and to help reform Italian science policy-making and research spending. But now, since Leopoldo Rubinacci, the Minister of Research Technology, failed to win reelection to Parliament ... the Ministry is in jeopardy and his ideas concerning reform have become a political football ... Many of the Ministry's supporters would like to see adoption of a system like that used by the U.S. National Science Foundation, in which detailed proposals must be submitted and the direction of research must be clearly defined ... [But], there are many professors in the Senate and they actively resist any challenge to their grip on informal patronage and control of research projects in the universities, said a government official".

218. "R&D Spending Up in Italy", *Industrial Research*, v. 10, no. 9, September 1968, p. 34.

The "Confindustria", Italy's National Association of Industrialists and Manufacturers, just completed a study showing increased capital spending on research in Italy. The study was based on a survey of 700 Confindustria members and 218 companies with less than 100 personnel. According to the study, $252.48 million was spend last year on pure, applied, and product-development research by private industry. This is approximately 10% more than the $228.64 million spent in 1966 and 26.7% more than the $199.2 million spent in 1965. The study indicates that spending on research has risen from 2.36% of earnings in 1965 to 2.58% of earnings in 1966.

219. "Japanese to Work at Novosibirsk", *Scientific Research*, v. 3, no. 18, 2 September 1968, p. 21.

Japanese scientists will be working jointly with Soviet scientists at the Soviet Nuclear Physics Institute in Novosibirsk late in 1970. After discussions in Moscow between Gersh Budker, the Soviet physicist in charge, and Masatoshi Koshiba of the University of Tokyo, the Russian invitation was extended to work on proton-antiproton colliding beam experiments. It is still not known what part the Japanese will play in the experiments. American physicists have not been formally invited to participate, however, scientists at the Stanford Linear Acceleration Center and the National

Acceleration Laboratory are confident invitations will be extended. The two Soviet proton synchrotrons to be used in the experiments are the 3.5-GeV machine, to be completed later this year, and the 25-GeV machine, to be ready toward the end of 1970.

220. "Japanese Scientists' Charter", New Scientist, v. 39, no. 611, 22 August 1968, pp. 368-369.

The long-promised bill to direct and stimulate Japanese science and technology is expected to meet opposition from a variety of quarters. In its latest form, the bill charges the national government with the "twin aims of determining the basic direction of Japan's scientific and technological effort and of ensuring ... more effective financial support". The government is to fix the outline for 'well coordinated and sharply prospective long-range plans to promote studies in areas of importance'. It is also to ensure the "cooperative interchange of personnel between different research institutions so that major programmes 'determined in key fields can be readily developed and successfully concluded'". Under the bill, a "scholarship system would also be instituted to allow scientists and technologists employed in industry to improve their qualifications". Opposition is expected to come from some academicians who "have a lively fear of government encroachment. Others think the bill does not go far enough". On political grounds, opposition to "joint programmes, particularly with the U.S.", is expected.

221. Griffin, S., "Japan Sets Her Sights on Space", New Scientist, v. 39, no. 606, 18 July 1968, p. 127.

Japan is on the verge of joining the "space club" with plans to launch ten scientific satellites in the coming three years. The satellite program is being conducted by the University of Tokyo's Institute of Space and Aeronautical Science. Its space activities "are concentrated in those fields where the U.S. and the Soviet Union have not yet made major efforts to explore and where Japan's advanced observation technology can be put to full use". Some of the missions of the satellites include: acquisition of data on electron and ion densities, radio noise at short wavelengths, and cosmic rays in space; observation of time variations of radio noise accompanying abnormal emissions from the sun; a probe of the ionosphere surrounding the Earth, and the magnetosphere existing on its fringes; observation of the interaction of solar radiation with the earth's atmosphere; direct observations of the ionosphere; and a more systematic survey of ionospheric phenomena. If the programme goes smoothly, all ten scientific satellites should be in orbit before mid-1971.

222. Kuan-tzu, "Republic of Korea's KIST Comes of Age", Chemical & Engineering News, v. 46, no. 42, 30 September 1968, pp. 22, 25.

The Korea Institute of Science and Technology (KIST) has been established to support and "advance Korean economic development through direct links with the nation's industrial community". After Battelle Memorial Institute (BMI) conducted a study of the feasibility of establishing a research organization such as KIST, the institute was officially founded in 1966. Financial support from the Korean and U.S. governments is assured until the institute becomes self-sufficient. Working in conjunction with BMI, KIST initiated a series of technical-economic surveys of Korean industries to examine the present level of development and limiting conditions. The studies indicated three areas in need of technical assistance and development: "technical information that can be derived from technical literature"; "practical demonstrations of the application of good industrial practice"; "importation of developed and established technology from outside Korea". In response to the needs of Korea, 16 laboratories, including physical and chemical metallurgy, polymer chemistry, and marine products, have been established. KIST's volume of contract research and technical services may reach a value of $300,000 this year, last year it amounted to about $60,000.

223. "Groom Technical Talent", Industrial Research, v. 10, no. 9, September 1968, pp. 33-34.

This article discusses Mexico's concentrated effort to insure enough skilled technicians for the future. The total budget for technical education is over $80-million ($32-million boost from last year) or "25% of the national budget". This will provide for only about 12.5% of the needed scientists and technicians for 1975. An estimated 125,000 skilled and semi-skilled workers must be trained annually in the fields of mechanics, electricity, chemistry, construction, and textiles. The current thought is that private industry should bear the responsibility of technical education since it stands to gain most. Although private industry is beginning to establish and support technical education, in the past it avoided training programs. Many of the firms now plan to pay half the cost for education and donate technical equipment.

224. "A Cooperative Effort in Physics", Scientific Research, v. 3, no. 20, 30 September 1968, pp. 13, 15.

"Danish and Swedish high-energy physicists are creating a spiral-reader facility in Stockholm as the second step in a program of Scandinavian physics cooperation ... The facility will be run as an independent service center for bubble-chamber physicists in Sweden and Denmark ... [The idea of the cooperative program is] that as smaller member states of the European Organization for Nuclear Research (CERN), they needed to build up strong regional research groups in order to get maximum benefit from their participation in the organization. The $400,000 spiral reader is financed by the Swedish State Council for Atomic Research and the Danish State General Scientific Research Fund. Sweden is assuming 62 percent of the cost. Annual running expenses are estimated at $60,000 to $80,000 ..."

225. "Report on Science of Science Activity", SSF Newsletter, v. 3, no. 5, August 1968, pp. 3-4.

Some of the recent and current USSR activities in the science of science, science policy, and technological forecasting are reported by Dr. A. L. Mackay. Among the activities mentioned are: a "Section for the General Science of Science and for Information in the Institute of Mathematics at Kiev, consisting of a staff of 65 (15 PhD's) and headed by G. M. Dobrov; preparation of a series of volumes reviewing the last 50 years of science in the USSR, by the Institute for the History of Science and Technology in Moscow; a study on the characteristics of patents and their profitability; and a study of technical information flow. In addition, new science-based factories are being set up in Novosibirsk on an experimental basis. Several recent conferences dealing with such topics as "the direction, planning and organization of scientific and technological research", and "Present-day problems of scientifico-technological forecasting", are cited. In this connection, technological forecasting is said to be "a fashionable topic". "Only now is the USSR beginning to approach the situation of the twenties, where thinking about the planning of science in the USSR was ahead of that elsewhere".